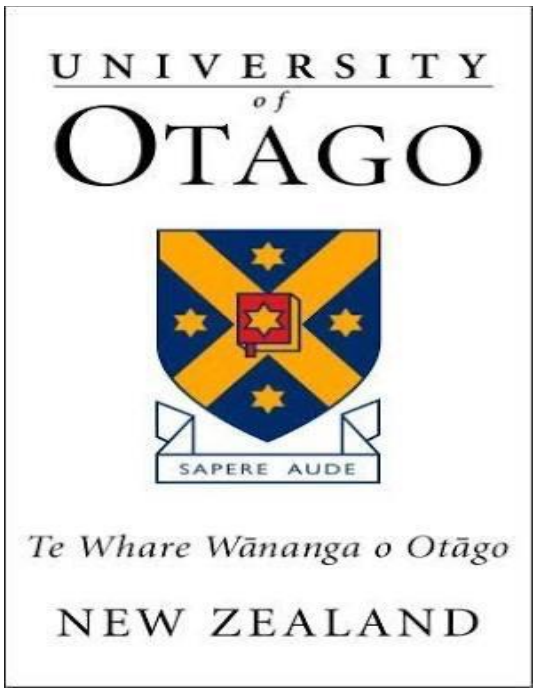
Self-Harm in New Zealand: Perspectives on Hospital Presentations and National Trends Across the Life Span



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Dedication

I would like to dedicate this study to all my patients who presented with self-harm, who shared their story, their struggle with life, and their battle with the stigma of the mental health 'label'. Each patient taught me to be a better clinician every day. The following is a poem gifted to me by one such patient who had battled her life with multiple self-harm attempts to 'get rid of her evil blood'.

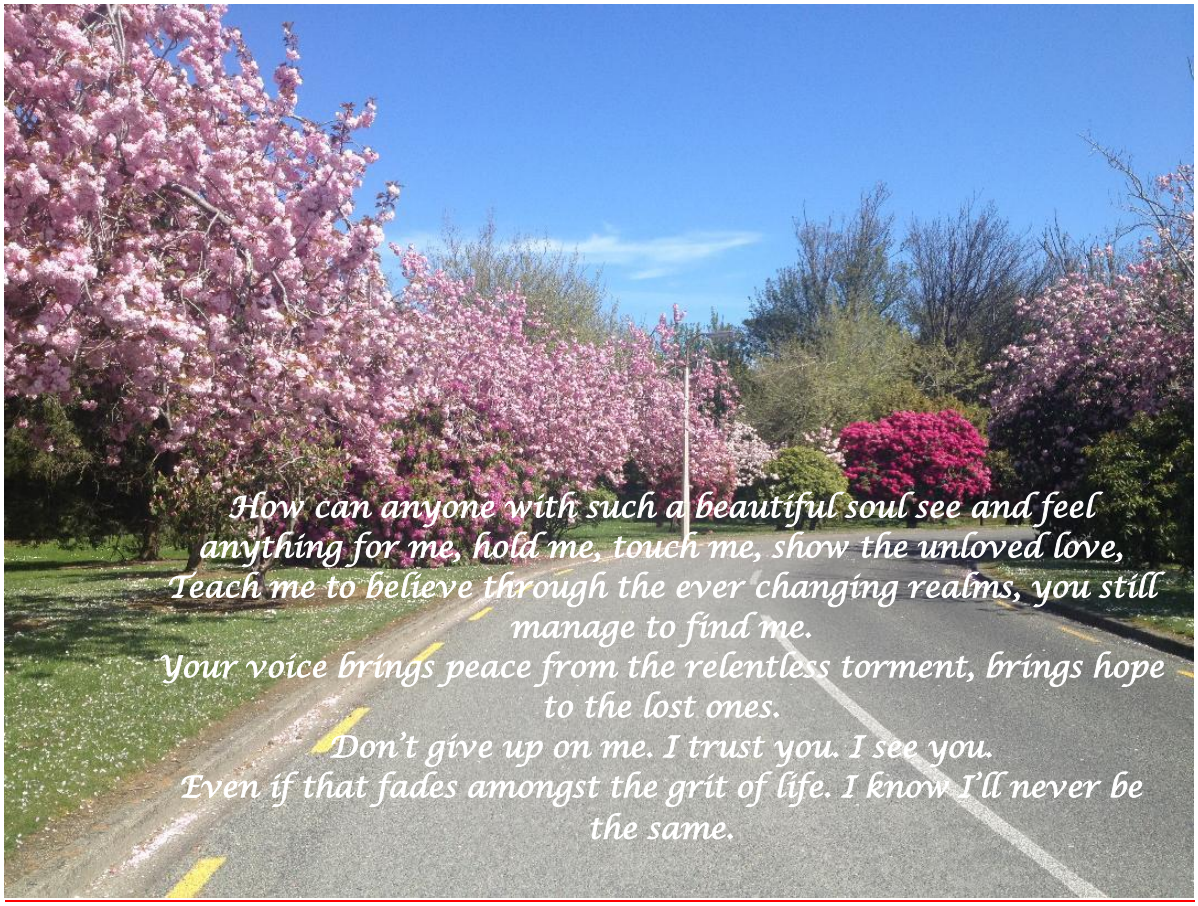


Table of Contents

Acknowledgements.....ii

Dedication.....iv

List of Tables.....ix

List of Figures.....x

Outline of order of information in the thesis.....xiii

Chapter 1: Introduction.....14

1.1 Introduction.....14

1.2 Perspectives on Self-Harm.....15

1.3 Brief Historical Overview of SH and Terms used to Describe it.....15

1.4 Psychological Models of SH.....18

1.4.1 Interpersonal Psychological Theory of Suicidal Behaviour.....18

1.4.2 The Three-Step Theory (3ST) of Suicide.....19
1.4.3 The Integrated Motivational-Volitional (IMV) Model of Suicidal Behaviour.....20
1.4.4 Overlap of the Three Theories.....21
1.4.5 Iceberg Model of Self-Harm (Arensman et al., 2018).....22

1.5 Status of SH in the Current Diagnostic Classification Manuals.....23

1.6 Risk and Protective Factors Associated with SH.....23

1.7 Justification for the Study of SH.....28

Chapter 2:.....29

Study 1: Urban and Rural Differences in SH Presentations in Invercargill,New Zealand.....29

2.1 Introduction.....29

2.1.1 Ethical Approval.....32
2.2.2 Objectives.....32

2.2 Methods.....32

2.2.1 Study Design.....33

2.2.2 Study Population 34
2.2.3 Catchment Area 34
2.2.4 Data Entry and Statistical Analysis 36

2.3 Results 36

2.3.1 Characteristics of the Entire Sample 38
2.3.2 Demographics of Individuals Engaging in SH in Urban and Rural Areas 39
2.3.3.... Clinical Characteristics of individuals engaging in SH in Urban and Rural Areas 45
2.3.4 Co-Morbid Psychiatric Disorders in SH 49
2.3.5 Co-Morbid Medical Disorders in SH 49
2.3.6. Methods Used in the Index SH 50
2.3.7 Violence and Abuse in SH 51
2.3.8 Stressors Related to the Index Episode of SH 51
2.3.9 Outcome of Index SH 52
2.3.10 Repetition of SH 53

2.4 Discussion 53

2.5 Limitations 59

2.6 Implications for Prevention of SH 59

2.7 Conclusion 61

Chapter 3: 62

Study 2: Self-Harm in Children and Youth Below 15 Years Presenting to Southland Hospital, Invercargill 62

3.1 Introduction 62

3.1.1 International Trends of Hospital-Treated SH 63
3.1.2 Hospital-Treated SH in New Zealand 65
3.1.3 New Zealand Psychiatric Clinical Studies 66
3.1.4 New Zealand Community Studies 67

3.2 Methods 67

3.3 Results: Rates of SH in Children and Youth Below 15 Years in Invercargill, New Zealand 68

3.3.1 Demographics of Patients Engaging in SH 68
3.3.2 Clinical Characteristics of Children and Adolescents with SH 68
3.3.3 Methods of SH 69
3.3.4 Stressors Associated with Index SH 71
3.3.5 Substance Abuse and Violence in Patients with SH 72
3.3.6 Aftercare of Patients with Index SH 73

3.4 Discussion 75

3.5 Limitations....79

3.6 Conclusion....79

3.7 Future Implications....80

Chapter 4: 81

Study 3: Self-Harm in Under 15-Year-Olds – 5 year National Trends in New Zealand....81

4.1 Introduction....81

4.2 Method....82

4.3 Results....83

4.3.1 Total Number of Cases of SH....83
4.3.2 .....Demographics: Age and Gender of Individuals Presenting with SH....85
4.3.3 Demographics: Ethnicity and SH....85~~84~~
4.3.4 SH, Deprivation Scores, and Age-Specific Rates....85
4.3.5 SH and Mental Health Diagnosis....86
4.3.6 SH in Single and Multiple Attempts....86
4.3.7 Generalised Linear Model and Probability for Repeat SH....87

4.4 Discussion....88

4.5. Limitations....90

4.6. Conclusion....90

Chapter 5: 92

Study 4: Clustering of Self-Harm in Invercargill, New Zealand....92

5.1 Introduction.... ..92

5.1.1 Types of Clusters....93
5.1.2 Difference Between Contagion and Cluster....93

5.2 Clustering of SH in Invercargill, New Zealand....95

5.2.1 Methods....95
5.2.2 Statistical Analysis....102

5.3 Results....104

5.4 Discussion....106

5.5 Limitation....108

5.6 Conclusion....108

Chapter 6: Discussion.....110

6.1 Introduction.....110

6.2 Principal Findings in the Population Presenting with SH.....110

6.3 Principal Findings in Children and Young Adolescents Presenting with SH.....114

6.4 Principal findings of the Five-Year National Trends of SH in New Zealand.....117

6.5 Principal Findings of the Clustering of SH in Invercargill.....119

6.6 Limitations of this Study.....120

6.7 Implications of Research Findings.....120

6.8 Conclusions.....124

References.....125

Appendix A: Data Sheet.....158

Appendix B: Tables for Urban/Rural SH.....160

Table 2a: Demographics of patients engaging in SH living in rural and urban areas.....160

Table 2b: Clinical characteristics of patients engaging in SH in urban and rural areas.....161

Table 2c: Substance abuse in patients engaging in SH (Urban and Rural areas).....162

Table 2d: Various Psychiatric diagnoses in patients enaging in SH living in urban and rural areas.....163

Table 2e: Various medical diagnoses in patients engaging in SH living in urban and rural areas.....163

Table 2f: Methods of SH used by patients living in rural and urban areas.....164

Table 2g: Violence/Abuse in patients engaging in SH living in Urban and Rural areas.....164

Table 2h: Distress related to index SH (Urban and Rural residence).....165

Table 2i: Outcome of index SH.....166

List of Tables

Chapter 1

Table 1	Terms Used in Literature	18

Chapter 2

Table 1	Descriptors of Characteristics of Urban and Rural Classification	33
Table 2	Individual Number of Episodes of SH	38
Table 3	Characteristics of the Entire Sample	39
Table 4	Comparison (SH episodes) and (SH in Individuals) of Education and Employment in Adults	39

Chapter 3

Table 1	Patient Demographics by Gender	68
Table 2	Clinical Characteristics of Patients with SH	69
Table 3	Methods of SH…	70
Table 4	Past History and Family History of SH and Suicide Across Different Methods of SH	71
Table 5	Stressors Associated with Index SH	72
Table 6	Substance Abuse and Violence in Patients with SH	73

Chapter 5

Table 1	NZDep 2006 Combines the Following Census Data (Calculated as Proportion) for Each Small Area	98

List of Figures

Chapter 1

Figure 1	Illustration of Three-Step Theory of Suicide (3ST)……..	20
Figure 2	The IMV Model of Suicidal Behaviour	22
Figure 3	Iceberg Model of Self- Harm	23

Chapter 2

Figure 1	SH Cases Included in this Study	37
Figure 2	Ethnicity of Urban/Rural Populations Presenting with SH	40
Figure 3	Age Cohorts of Urban/Rural Populations Presenting with SH	41
Figure 4	Gender of Urban/Rural Populations Presenting with SH	41
Figure 5	Marital Status of Urban/Rural Adult Populations Presenting with SH	42
Figure 6	Living Circumstances in Urban/Rural Populations Presenting with SH	42
Figure 7	Employment Status in Urban/Rural Populations Presenting with SH	43
Figure 8	Highest Level of Education in Urban/Rural Populations Presenting with SH…	44
Figure 9	SH and WINZ Benefit Status in Urban/Rural Populations Presenting with SH	44
Figure 10	Co-Morbid Disorders in Urban/Rural Populations Presenting with SH	45
Figure 11	Substance use Disorders in Urban/Rural Populations Presenting with SH	46
Figure 12	Substance use in Index SH Episode in Urban/Rural Populations	47
Figure 13	Treatments at the Time of Index SH Episode in Urban/Rural Populations	48
Figure 14	Family History of Psychiatric Disorder, SH, and Suicide in Urban/Rural Populations Presenting with SH	48
Figure 15	Psychiatric Co-Morbidity in Urban/Rural Populations Presenting with SH	49

Figure 16	Medical Co-Morbidity in Urban/Rural Populations Presenting with SH	50
Figure 17	Methods of SH in Urban/Rural Populations Presenting with SH	50
Figure 18	Violence/Abuse in Urban/Rural Populations Presenting with SH	51
Figure 19	Stressors in Urban/Rural Populations Presenting with SH	52
Figure 20	Outcome of SH in Urban/Rural Populations Presenting with SH	53

Chapter 3

Figure 1	Clinical Characteristics of Patients Presenting with SH	69
Figure 2	Methods of SH	70
Figure 3	Past History and Family History of SH and Suicide Across Different Methods of SH	71
Figure 4	Stressors Associated with Index SH	72
Figure 5	Substance Abuse and Violence in Patients with SH	73
Figure 6	Aftercare Following Index SH	74

Chapter 4

Figure 1A	Number of Cases of SH and rates of SH in Individuals <15 Years by Year	84
Figure 1B	Age at SH Episode, by Gender	84
Figure 1C	Age-Specific SH Rates/100,000 by Ethnic Group	85
Figure 1D	Relationship Between Age-Specific SH Rates/100,000, Ethnicity, and Deprivation Index	86
Figure 1E	Relationship Between Age-Specific SH Rates/100,000 and Deprivation Index Quintile (NZDep: 10 = most deprived) for Individuals with Single versus Repeated SH Episodes	87
Figure 1F	Generalised Linear Model of the Probability for Repeat SH by NZDep Score, Presence or Absence of a Mental Health Disorder (MHD +/-), and Gender	88

Chapter 5

Figure 1	The Urban Area of Invercargill, New Zealand	97
Figure 2	Panel A: Small areas mesh blocks for urban Invercargill Panel B and C: Clustering of New Zealand Deprivation Index. Panel D: Frequency of self-harm and deprivation.	99

Figure 3	Small mesh blocks for urban Invercargill with deprivation quintiles	100
Figure 4	Road pattern for urban Invercargill	101
Figure 5	K(r) using Euclidean distance (L2)	105
Figure 6	One-sided Significance Measures for K(r) Using Rotation of Observed and Simulated Events with Manhattan Distance	106

Outline of Order of Information in the Thesis

The findings reported in this thesis are organised in the following manner:

Chapter 1: Introduction

Chapter 2: An examination will be made between SH in urban and rural populations of Southland to see if there are differences in their presentation.

Chapter 3: Explores SH in children and young adolescents presenting to Southland Hospital, Invercargill.

Chapter 4: Discusses SH in a 5-year national youth data set, assesses if self-harm was associated with deprivation scores, and if repetition of self-harm was more common in individuals with mental health disorders.

Chapter 5: Explores whether there is evidence of clustering seen in SH in Invercargill, and assesses influence of covariates.

Chapter 6: Integrates findings of the study and explains implications for preventive strategies to reduce SH and suicide in New Zealand.

Chapter 1: Introduction

1.1 Introduction

Although I received my psychiatry training in one of the premier psychiatric institutes of India, I did not have a great deal of experience with self-harm (SH) or suicide. My interest in SH began after coming to New Zealand in 2006. I was stunned to see the number of individuals who were seen post-SH. Some SH visits/ hospitalisations were associated with mental health conditions, and some were related to psychosocial situations. What surprised me most in my early days in New Zealand working as a new consultant was the ease with which some clients would report SH in very 'matter of fact' statements. I wanted to learn more about the 'why's and not just manage the aftermath of SH. This curiosity led to the conception of this study. The following case vignettes show a wide range of SH seen in hospital settings. Certain aspects of patient histories have been changed to mask the identity of patients.

Vignettes:

1. *A 16-year-old girl, 'A', lived with her mother and mother's partner. She was in year 11 at high school. Her relationship with her mother was tumultuous. Her older sister, with whom she shared a close relationship, had recently gone to an alcohol rehabilitation centre. 'A' was brought to the emergency department (ED) after she took an overdose of her mother's pain medication in the context of an argument with her mother over a letter from school principal about her 'cutting behaviour in school bathroom' and physical fights with other girls the previous day.*
2. *A 22-year-old girl, 'B' had numerous scars on both her forearms. She had a history of inflicting injuries whenever she felt frustrated or anxious. She would often cut herself when her demands were not met. 'B' had a management plan, and she was allowed a 24 hours admission at her request on the inpatient ward. She requested current admission as her case manager had gone on annual leave and she 'felt rejected and wanted to cut her wrists.'*
3. *'C' was a 46-year-old gentleman with a longstanding enduring mental illness, managed on Clozapine. He lived alone in a council flat. He had a past history of an attempt to enucleate his eyes when psychotic. He became non-compliant with his medications and was brought to ED after he grievously harmed himself in response to his auditory hallucinations.*

1.2 Perspectives on Self-Harm

According to the World Health Organization, every year, roughly 800,000 people die due to suicide, which is one person every 40 seconds. It has also been shown that many more attempt suicide. Suicide is the third leading cause of death globally among 15–29 years olds (WHO, 2019). Self-harm (SH) is one of the most important risk factors for suicide and hence a better understanding of SH and a focus on adequate resources for individuals who engage in self-harm are of great importance to achieve the goal of reducing suicide (Hawton and van Heeringen, 2009; Isometsä and Lönnqvist, 1998; Suominen et al., 2004). Suicide attempts and SH is common and remains a significant public health concern in New Zealand; many people with suicidal behaviours do not see a health professional during the time that they have been suicidal (Beautrais et al., 2006). SH is a strong predictor of suicidal behaviours and approximately 1% of people who self-harm will die by suicide over the next year and above 5% in the next nine years (Owen et al., 2002). Among those who die by suicide, between one third and half have a history of intentional SH (Hawton et al., 1999). Those who die by suicide and those who have medically serious suicide attempts are two overlapping populations and often have similarities in psychiatric diagnosis and history (Beautrais, 2001).

1.3 Brief Historical Overview of SH and Terms used to Describe it

SH is a relatively common problem. It may present in young and old people. SH has been represented and understood in divergent ways by society through the ages. In the first half of last century, very little difference in terminology was made between people who killed themselves and those who survived after an apparent suicidal act. Stengel (1952) differentiated between these two groups and proposed the terms ‘suicide’ and ‘attempted suicide’. Kessel and Grossman (1961) recognised that most ‘attempted suicides’ had been performed in the belief that they were comparatively safe even in the heat of the moment, that the people doing it would survive an overdose, and also be able to disclose what they had done in good time to ensure rescue. Hence, they proposed that suicidal intent was not an essential criterion; they suggested that ‘attempted suicide’ should be replaced by ‘deliberate self-injury’ and ‘deliberate self-poisoning’. These terms clarified that the act was not accidental, but did not assume whether desire of death was there or not.

By end of the 1960s, these terms became widely used. The term ‘parasuicide’ was introduced by Kreitman (1969, p. 747) and his colleagues. It referred to “an event in which patient simulated or mimicked suicide, in that he was the immediate agent of an act which is actually or potentially physically harmful to himself”. This excluded the possibility of whether death was a desired outcome.

Bancroft et al. (1975), while studying epidemiological aspects of self-poisoning and self-injury in the Oxford area, reported other aspects to self-poisoning: “it was deliberate ingestion of more than prescribed amounts of medicinal substances or ingestion of substances never intended for human consumption, irrespective of whether harm was intended” (p. 170).

Morgan et al. (1975) suggested the term ‘deliberate self-harm’ (DSH), to include deliberate self-poisoning and deliberate self-injury. The term DSH is sometimes considered a misnomer because the act is not invariably harmful even though it is done with the knowledge that it might cause harm.

Canetto and Lester (1995) suggested the use of the term ‘non-fatal suicidal behaviour’; they argued that the term ‘attempted suicide’ implied that the goal of all suicidal behaviours was death by suicide. This was not considered to be true by O‘Carrol et al. (1996) and according to them, the term ‘attempted suicide’ should be reserved for cases in which there was at least some level of intent to die by suicide. They proposed terms that can be understood on a spectrum, which ranged from suicidal ideation, in which there was self-reported thoughts of engaging in suicide related behaviour, progressing to suicide threat. This is a verbal or non-verbal interpersonal act, which is short of direct SH. In self-injurious behaviour, intent to die is absent. These behaviours, if used to get attention or help, are called ‘instrumental suicide related behaviour’. For O‘Carrol et al. (1996), a suicide attempt is a self-injurious behaviour where the intent to die is present and suicide is on the extreme end of the spectrum, where death occurred as a result of the behaviour.

Hawton (2002b) has defined deliberate self-harm as an act with a non-fatal outcome in which an individual deliberately did one or more of the following:

- Initiated behaviour (e.g., self-cutting, jumping from a height), which they intended to cause SH.

- Ingested a substance over the prescribed or generally recognised therapeutic dose.

- Ingested a recreational or illicit drug that was an act that the person regarded as SH.

- Ingested a noningestible substance or object.

Kapur (2005) preferred to use SH, as has been suggested in the NICE (National Institute for Health and Care Excellence) guidelines (National Collaborating Centre for Mental Health, 2004). SH has been defined as a "self-poisoning or injury, irrespective of apparent purpose of the act" (NICE, 2004, p 16) . Nock et al. (2006) have proposed the concept of self-injurious behaviour, which refers to a broad range of behaviours where an individual has caused a direct and deliberate injury to harm themselves regardless of an intent to die.

De Leo et al. (2006) proposed unifying terminologies after the World Health Organization (WHO) multicentre study of parasuicide, but this has not been adopted universally.

In this thesis, I have preferred to use the term SH as this term has been commonly used in our service here at Southland Hospital, Invercargill, and as my data was a retrospective collection, chances of missing SH were minimised by using this term. SH was defined as "an act with a non fatal outcome in which an individual deliberately did one or more of the following: initiated behaviour (like self- cutting, jumping from a height) which they intended to cause SH; ingested a substance excess of the prescribed or generally recognised therapeutic dose; ingested a recreational or illicit drug that was an act the person regarded as SH; ingested a non ingestible substance or object" (Hawton et al., 2002b, p.1208). Table 1 shows the commonly used terms.

Table 1
Terms Used in the Literature

Terms	Commonly in	Intent	Exclusion criteria
Attempted suicide	Used widely (especially in North America)	Some suicidal intent present or without reference to the intent.	Repetitive bodily harm excluded.
Deliberate* Self-harm	In UK In North America	Regardless of intent. Without intent.	Excludes overdoses and methods of high lethality.
Parasuicide	Especially in Europe	Without intent.	Repetitive bodily harm excluded.
Self-poisoning or self-injury	Worldwide	Regardless of suicidal intent.	None.
Self-mutilation (Self-injurious behaviour (SIB), self-wounding)	Worldwide	Without suicidal intent.	None.

*The adjective 'deliberate' is not favoured by the patients in UK.

1.4 Psychological Models of SH

There are numerous models of suicidal behaviour. These psychological theories provide a framework to understand how different factors combine to increase the risk of suicide. These models also helps to identify modifiable targets for treatment to reduce the incidence of SH and suicide. Some of the theories are being discussed below.

1.4.1 Interpersonal Psychological Theory of Suicidal Behaviour

In the early 21st century, Thomas Joiner introduced the interpersonal theory of suicide, which provided a framework through which suicidal ideation progressed through to suicidal attempts. This is an interactive theory, which believes that a combined occurrence of perceived burdensomeness (i.e., feelings like "I am a burden on others"), failed belongingness (i.e., feelings like "I do not belong here"), and feeling hopeless that these states will not change, produces a desire to die (i.e., suicidal ideation). Suicidal desire is necessary but not enough to produce a suicide attempt. For this, the individual also requires a capability to attempt suicide. When a person with strong suicidal desires acquires the capability to attempt suicide, the risk of a serious suicide attempt increases. Acquired capability comprises reduced fear of pain, injury, death, and increased tolerance of physical pain. Due to previous repeated exposure to and

encounters with painful experiences, the individual's tolerance for physical pain is increased through the habituation process (Joiner et al., 2009).

1.4.2 The Three-Step Theory (3ST) of Suicide

Based on Joiner's 'ideation to action' framework, Klonsky and May (2015) proposed a three-step theory in which the stages from suicidal ideation to suicide attempt are influenced by four factors: pain, hopelessness, connectedness, and suicide capacity.

Step 1 – Development of suicidal ideation:

The most important step is the development of pain (either physical or emotional pain) regardless of its source. Pain often decreases the desire for living. If the individual is hopeful and believes that their situation will improve, he/she will always focus on positive aspects of living. However, if the individual lacks hope, his/her desire for living is diminished. Hence hopelessness is crucial for development of suicidal ideation. That is, a combination of pain and hopelessness brings about suicidal ideation.

Step 2 – Strong versus moderate ideation:

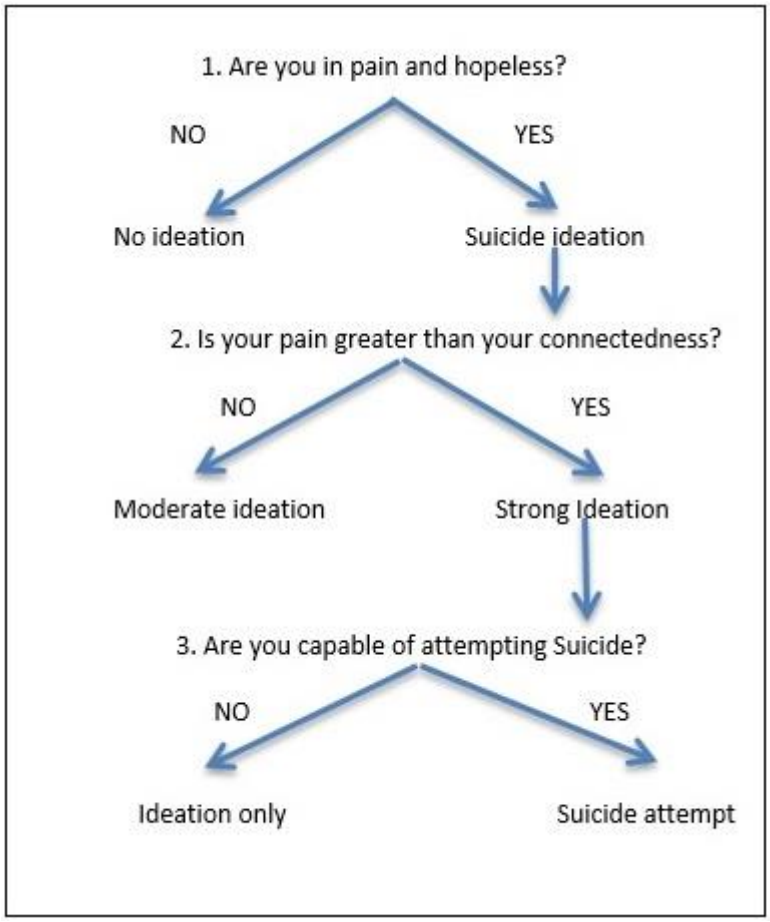
The second step towards progression to suicidal ideation involves connectedness. This can be understood as attachment to one's family, job, interests, or any other purpose that keeps one invested in living. If connectedness is good, even when someone is in pain and feels hopeless and considers suicide, suicidal ideation will only be moderate. In other words, connectedness proves to be protective against intense suicidal ideation in those with high risk of suicide due to pain and hopelessness.

Step 3 – Progression from ideation to attempts:

Whether an individual will act on suicidal ideation depends on whether the person has the capability of doing so. It is proposed that the capability depends on three variables – dispositional, acquired, and practical.

A dispositional variable is primarily driven by the genetics of the individual, for example, high or low threshold for pain, or blood phobia. Acquired variables are the factors that increase probability of a suicide attempt due to habituation of experiences associated with pain, injury, fear, or death. Practical variables refer to concrete factors that make a suicide attempt easier, for example, access to lethal means.

Figure 1
Illustration of Three-Step Theory of Suicide (3ST)



Note: From "The three-step theory (3ST): A new theory of suicide rooted in the 'ideation to action' framework," by E. D. Klonsky and A. M. May, 2015, *International Journal of Cognitive Therapy*, *8*(2), p. 116 (https://doi.org/10.1521/ijct.2015.8.2.114).

1.4.3 The Integrated Motivational-Volitional (IMV) Model of Suicidal Behaviour

Based on diathesis-stress model, the IMV model of suicidal behaviour is a tripartite model, and describes emergence of suicidal behaviour in three phases, pre-motivational phase, motivational phase, and volitional phase (O'Connor and Kirtley, 2018).

1. In the pre-motivational phase, the presence of stressors combined with the background vulnerability of the individual increases the risk of developing suicidal ideation.These vulnerability factors could be personality factors or socio-environmental factors. Intention to carry out the behaviour is the strongest immediate predictor of suicidal behaviour.

2. In the motivational phase, a relationship between defeat, humiliation, and entrapment is formed. This can be understood as the times when one experiences the

feeling of being defeated; when there is no escape, there is entrapment. Entrapment can be internal or external and often gives rise to agitation. In such situations, suicide becomes the only perceived way out. Defeat often leads to entrapment when there is the presence of a threat to self-moderators. In the final part of the motivational phase, there is a transition from entrapment to suicidal ideation. This is directly influenced by the presence or absence of motivational moderators.

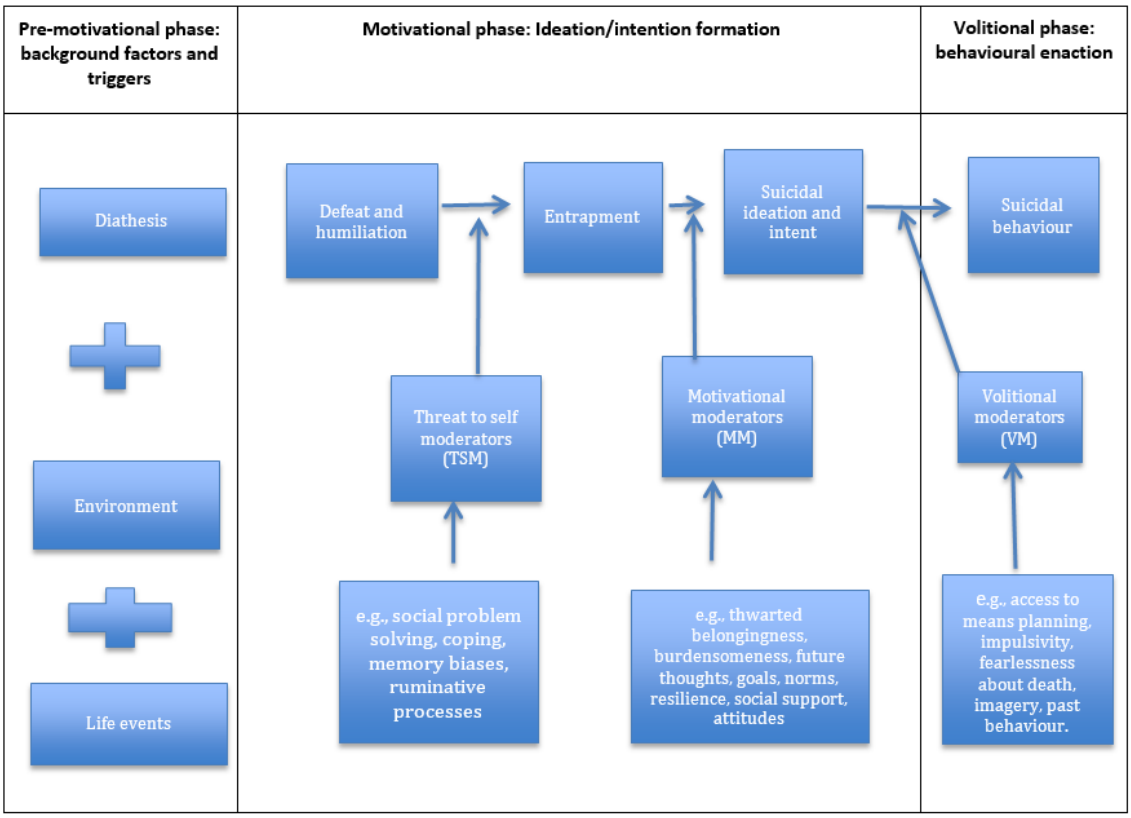
3. The volitional phase is the final phase in the IMV model. Here the volitional moderators govern the transition from suicidal ideation/intent to enaction. The IMV model proposes that fearlessness about death and increased pain tolerance are volitional moderators. Having access to the means of suicide is an environmental volitional moderator, whereas exposure to the suicidal behaviour of others is a social volitional moderator. A past history of SH or suicide attempts is also a volitional moderator.

1.4.4 Overlap of the Three Theories

Joiner's interpersonal theory of suicide has emphasised that acquired capability leads to behavioural enaction (i.e., suicide attempts, SH). It is one of the factors (of the volitional phase) within the IMV model which also increases the likelihood of a suicidal attempt, other factors being exposure to the suicidal behaviour of others, impulsivity, and access to the means of suicide. Klonsky's three steps to suicide emphasises the importance of pain and feeling hopeless in conjunction with a lack of connectedness (motivational moderators of the IMV model) leading to suicidal ideation and can lead to suicide when it occurs in someone capable of attempting suicide (acquired capability of interpersonal theory of suicide).

Figure 2

The IMV Model of Suicidal Behaviour



Note: From "The integrated motivational-volitional model of suicidal behavior" by R. C. O'Connor & O. J. Kirtley, 2018, *Philosophical Transactions of the Royal Society B: Biological Sciences, 373*(1754) p. 2 (https://doi.org/10.1098/rstb.2017.0268).

1.4.5 Iceberg Model of Self-Harm (Arensman et al., 2018)

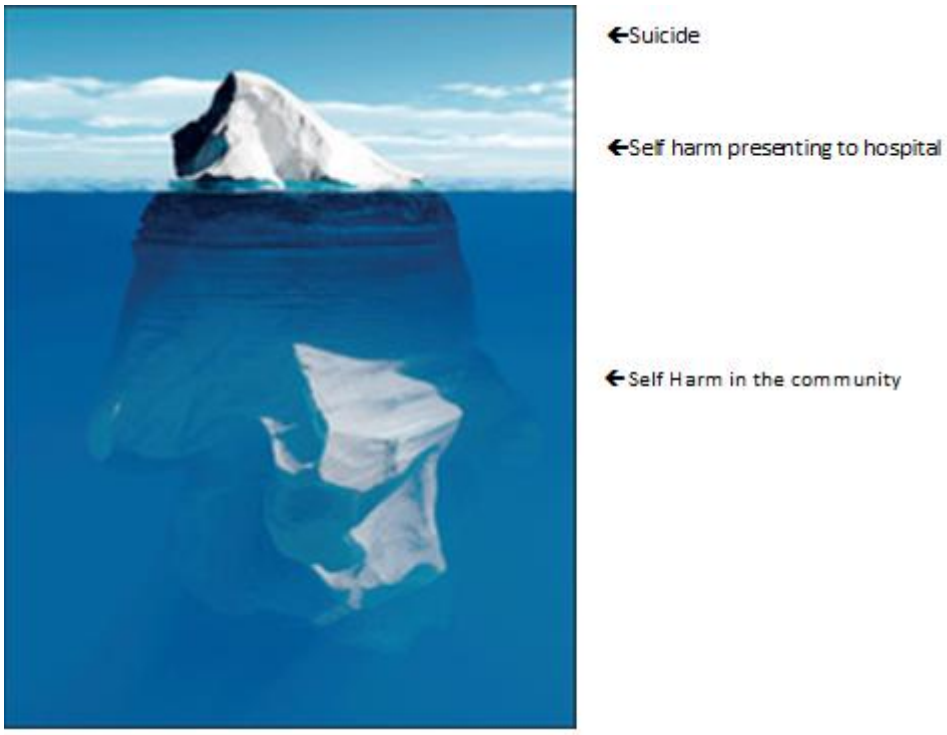
SH can be understood in terms of the iceberg model of self-harm:

i) Fatal SH, that is, suicide: an overt but uncommon form forming the tip of the iceberg;

ii) SH that results in presentation to hospitals/GPs, which is also overt but frequent;

iii) SH that occurs in the community, which is extremely common but is mostly hidden, like the submerged part of the iceberg (Figure 3) (Arensman et al., 2018).

Figure 3
Iceberg Model of Self-Harm



Note: From "The iceberg model of self-harm: new evidence and insights" by E. Arensman, P. Corcoran, and E. McMahon, 2018, *The Lancet, 5*(2), p. 100 (https://doi.org/10.1016/S2215-0366(17)30477-7).

1.5 Status of SH in the Current Diagnostic Classification Manuals

DSM 5-outlines the term 'non-suicidal self-injury' (under conditions for further study) where the person has engaged in intentional self-inflicted damage to the surface of his/her body, likely to produce bleeding, bruising, or pain. It is expected that the injury will produce only minor or moderate physical harm. There is no suicidal intent. DSM-5 has also acknowledged suicidal behaviour disorder (under conditions for further study) where the individual has made a suicide attempt. The individual has performed a behaviour where there was some intent to die. In the UK, the term SH is used regardless of the intent. It is coded on Z91.5 under ICD10 CM diagnosis code.

1.6 Risk and Protective Factors Associated with SH

People who SH do so for myriad reasons, sometimes as a means of expressing their emotional pain. They may sometimes have the intent to end their lives. The behaviour is often associated with ambivalence. SH is believed to exist along a continuum of suicidal behaviour with death by suicide at the extreme end of the continuum. In the study by

O'Connor et al. (2009), it was noted that among the adolescents who had engaged in SH, four out of ten did so with the intent to take their own life.

SH is dependent on a complex interaction of genetic, behavioural, psychiatric, psychological, social, and cultural factors (Hawton et al., 2012). Some risk factors work at the population level, such as social isolation, economic turmoil, and rapid changes in social structure or values (Turecki and Brent, 2016). At an individual level there is an interaction between the predisposing and precipitating factors which ultimately has an influence on SH behaviour. The predisposing factors can be conceptualised as distal factors, and precipitating factors as proximal factors. In between the two are the mediating factors, which are also understood as developmental factors (Turecki and Brent, 2016). The risk factors working at the individual level are discussed below:

A. Distal or Predisposing Factors:

Neurobiological and Genetic Factors

Various behavioural and molecular genetic studies have demonstrated that genetic factors play a role in SH (Gould et al., 1996; Gould et al., 1998; Brent et al., 1994). Twin studies and adoption studies have shown that there are higher rates of suicidal behaviours are heritable (Roy et al., 1991; Brent and Mann, 2005). Low concentrations of 5-HIAA (5 hydroxyindoleacetic acid, a metabolite of serotonin/5 hydroxytryptamine) have been found in cerebrospinal fluids of individuals who have harmed themselves (Träskman-Bendz and Mann, 2000). The other index of altered serotonergic function is blunted fenfluramine-stimulated prolactin release, and this has been related to the seriousness of the SH (Träskman-Bendz and Mann, 2000). Many teams have attempted to identify genetic markers and suicidal behaviours. A longitudinal study showed an interaction between 5-HTTLR polymorphisms and life stress for depression and SH (Caspi et al., 2003). Chang et al. (2016) in their meta-analysis of biological factors of suicidal behaviour have suggested cytokines and low levels of fish oil nutrients as predictors of future suicidal behaviour. Recently, Levey et al. (2019) identified several associations in genes or associated pathways implicated in suicide and suicidal behaviours. Epigenetic modifications near PGBD5 and NUP 133 have been associated with quantitative scores for suicidality (Jeremian et al., 2017). Suicidal ideation state

changes have been associated with increased expression of PHLDB2 in studies in men (Niculescu et al., 2015) and women (Levey et al., 2016).

Social and Family Factors

Longitudinal studies have shown an association between family environments during childhood and SH in adolescence and early adulthood (Fergusson et al., 2000; Brown et al., 1999; Johnson et al., 2002). Parental psychopathology acts a risk factor for SH in young people (Moscicki, 1997). Risk is also greater for children of separated or divorced parents and where there is a marital discord (Beautrais, 2000a; O'Connor et al., 2009; Fergusson and Lynskey, 1995; Johnson et al., 2002). Impaired parent-child relationships, poor family communication styles, and extremes of high and low expectations and control are associated with increased risk of SH in young people (Beautrais, 2000a). Maladaptive parenting and childhood maltreatment increases the risk of SH in adolescence (Johnson et al., 2002), and adverse childhood experiences like emotional, physical, and sexual abuse also increases the risk for SH in young people (Dube et al., 2001; Romans et al., 1995; Gladstone et al., 2004). School-based studies have shown an association between school bullying and SH in adolescents (De Leo and Heller, 2004; Hawton et al., 2002b; O'Connor et al., 2009).

A Swedish study found that being able to confide in family and friends helps people when they feel suicidal, and social networks were considered useful in the prevention of suicide (Eagles et al., 2003). Social support also moderates the risk of SH in people facing acculturation stress (Bunney et al., 2002). Religious affiliations have been shown to reduce SH (Statham et al., 1998; Dervic et al., 2004). Rates of SH are different in different societies. There is a strong disapproval of suicide in some Catholic and Islamic countries and this probably extends to SH as well (Skegg, 2005).

Sociodemographic Factors

The greatest risk for hospital presentations in the WHO/EURO study was in women aged 15–24 years and men aged 25–34 years (Schmidtke et al., 1996). It is less frequent before puberty but SH presentations are increasingly common from the age of 12 years (Hawton et al., 2012). Older people are at a lower risk of SH but when they do SH, they are much more likely to die by suicide later (Hepple and Quinton 1997). Presentations of SH to the hospital are more commonly seen in women (Schmidtke et al., 1996). In

adolescents, hospital-treated SH is most common among female adolescents compared to male adolescents (Hawton et al. 2003).

Marriage has a protective role in SH. Studies have shown that the risk of SH is higher in separated and divorced people (Petronis et al., 1990; Meltzer et al., 2002). The risk of SH and suicide may be increased in people with precarious employment situations (Platt and Hawton 2000). Employment effects such as income and low socio-economic status, along with low level of education and living in poverty have been shown to be risk factors for SH (Schmidtke et al., 1996; Beautrais, 2000a; Meltzer et al., 2002). Socio-economic disadvantages at a young age continue to predict SH independent of later mental health problems and other stressors in a person (Fergusson et al., 2000).

In men and women with gay, lesbian, or bisexual orientation, the risk of SH is higher compared to heterosexuals (Skegg, 2005).

B. Developmental or Mediating Factors:

Distal factors probably act through personality traits and cognitive styles of the individuals, and effect their SH behaviour.

Personality Traits and Psychological Factors

Certain psychological characteristics are more common among people who SH. Low self-esteem (O'Connor et al., 2009), external locus of control, hopelessness (Boergers et al., 1998), introversion, neuroticism, impulsivity, recklessness, problem solving (Williams and Pollock, 2000), aggression and impulsive avoidance, and lack of positive future-directed thinking increases the risk of SH (Skegg, 2005; Hawton et al., 2012; Beautrais, 2000a). There is growing evidence that perfectionism and self-criticism increases the risk of SH in clinical and community populations (O'Connor et al., 2010; Boergers et al., 1998; O'Connor, 2007).

An optimistic outlook, low neuroticism, low novelty seeking, high self-esteem, and good problem solving have been observed to increase resiliency, and hence can prove to be protective factors for SH (O'Connor et al., 2009; Skegg, 2005).

Early Life Adversities

Early life adversities can cause cognitive deficits, particularly in problem solving and memory specificity. These can influence other factors and contribute to SH behaviour

and suicidality (Yang and Clum, 2000; Sinclair et al., 2007). Early life adversities play an important role in adolescents and young adults as the adversity can interact with the still developing prefrontal cortex in adolescents and young adults, and thus increase the likelihood of risk taking and impulsive behaviour (Lee et al., 2014).

C. Proximal or Precipitating Factors

Proximal risk factors are temporally associated with SH behaviours.

Psychiatric and Physical Morbidity

The most common psychiatric disorders noted in persons who SH are depression, substance abuse, impulse control, and anxiety disorders (Haw et al., 2001; Souminen et al., 1996; Nock et al., 2013). Personality disorders are often seen as a co-morbid condition in those who SH (Haw et al., 2001). Attention deficit hyperactivity disorder (ADHD) and conduct disorder are also commonly seen in young adolescents who SH (Hawton et al., 2012). Increased impulsivity and risk taking might contribute to the association. Recent meta-analysis (Gili et al., 2019) has shown that mental disorders and co-morbidity are strong predictors of suicidal behaviour in young people. Identification and management of mental disorders may be an achievable step to reduce SH rates, especially in young people with mood disorders and anxiety (Gili et al., 2019).

Physical illness has also been associated with SH, particularly in the elderly (De Leo et al., 1999). Epilepsy (Hawton et al., 1980) and head injury (Mann et al., 1999) have also been associated with increased risk for SH. In a systematic review, Speigel et al. (2007) suggested that chronic abdominal pain is an independent predictor of suicidal behaviour after adjusting for co-morbid psychiatric conditions. Theodoulou et al. (2005) have suggested pain as being a contributory factor in a small proportion (4%) of their sample over a two-year period. Though 60% of their sample had reported pain for more than 6 months, only 12% had been attending the local pain clinic at the time of SH. Risk of SH should be assessed in patients with painful conditions as well, and clinicians should be mindful while prescribing for this population.

Environmental Factors

An adverse life event, such as an interpersonal conflict or a relationship breakdown, can trigger SH in a vulnerable person (Beautrais et al., 1997). There is an existence of contagion as suggested by clustering of SH in adolescents (Hawton et al., 2019), and the

media also occasionally facilitates SH (Hawton and Williams, 2002). Presentations of suicide in news and information media can influence copycat acts in particular circumstances (Pirkis et al., 2018). The availability of the means to SH contributes to the methods chosen. Many SH episodes are associated with excessive consumption of alcohol around the time of the SH episodes (Haw et al., 2005; Hufford, 2001).

Vulnerability and Resiliency to Suicidal Behaviours

Some factors can prove to be protective factors for SH. These are not merely the inverse of the risk factors, or rather, the absence of the risk factors, but are best described in parallel. Risk factors can be understood as factors increasing the vulnerability for SH, whereas the protective factors are those which increase the resilience in individuals and prevent the SH. Fergusson et al (2003) in their study of a 21 year extended cohort of 1,265 New Zealand young people have suggested that the vulnerability/resiliency to suicidal responses in depressed young people is influenced by the cumulative effects of various factors like family history of suicide, childhood sexual abuse, personality factors, peer affiliations, and school success. A positive configuration of these factors offers resiliency to individuals, whereas a negative configuration increases vulnerability.

1.7 Justification for the Study of SH

There are four principal reasons for the focus of this thesis on SH:

First, SH entails high cost to individuals and society in terms of suicide risk, morbidity, and health care expenditure in New Zealand.

Second, SH in young people is associated with increased risk of death by suicide. It is essential to understand the characteristics of SH in children and young adolescents presenting to hospital in order to design effective intervention and prevention strategies for SH in this age group.

Third, there is much public concern about self-harm, so I have looked at 5-year national trends in SH in children and adolescents < 15 years between 2008–2012.

Finally, there is concern that self-harm is “contagious”, so I have explored whether there has been a clustering of SH in Invercargill.

Chapter 2: Study 1: Urban and Rural Differences in SH Presentations in Invercargill, New Zealand

2.1 Introduction

There is often a disparity between the health of people living in urban and rural areas. Rural areas have characteristics that may put residents at a higher risk of mortality due to long travel times to reach hospitals or exposure to specific hazards. Higher rates of poverty and less access to health care may lead to poor health outcomes (Centre for Disease Control and Prevention, Rural Health, 2017). Rural communities may be at an increased risk of mental illness due to vulnerability to economic fluctuations and social isolation. People in rural communities usually work very long hours and have limited availability of off-farm employment. It has been shown that suicide rates are typically higher in rural New Zealand than urban New Zealand (Gallagher et al., 2008; Ministry of Health, 2015).

Suicidal behaviour is a significant public health concern in New Zealand; in 2015, 527 people died by suicide in New Zealand: 384 males and 143 females. Youth (15–24 years) were noted to have higher suicide rates compared with other life-stage groups. Māori had higher suicide rates than other ethnic groups in New Zealand across all age groups until older adulthood. The age-standardised rate of suicide for Māori males was 25.3 per 100,000 compared with 14.7 per 100,000 for non-Māori males. Māori females had a suicide rate of 11.5 per 100,000, which was more than double that of non-Māori females at 4.7 per 100,000 (Ministry of Health, 2015).

In 2013, 7,267 hospitalisations were reported for intentional SH in New Zealand (176.7 per 100,000 population). Females outnumbered males. The hospitalisation rate for SH for females was 246.9 per 100,000 and for males, 107.1 per 100,000. It was noted to be highest in females aged 15–19 years, at 912.6 per 100,000. In males, hospitalisation for SH was noted to be highest among the 20–24 year age group, at 229.8 per 100,000. The age-standardised rate of SH hospitalisation for Māori was 197.7 per 100,000, and for non-Māori, it was 172.2 per 100,000. Rates were higher for people living in more deprived areas. The highest rate was seen in people living in deprivation quintile 4

(226.3 per 100,000) and the lowest in quintile 1 (128.0 per 100,000) (Ministry of Health, 2013).

Risk Factors Associated with Suicide

People who present to hospital following an episode of SH are significantly more likely to die by suicide compared with those who have not had this experience. The incidence of suicide is highest in the year following discharge from the hospital (511.1 [451.7–578.2] per 100,000 person-years), particularly in the first month (1,787.1 [1,423.0–2,244.4] per 100,000 person-years) (Geulayov et al., 2019). People who engage in medically serious suicide attempts are more similar to those who die by suicide than the general population in terms of psychiatric diagnosis and history (Beautrais, 2001), which makes them an important group to understand when delivering and designing services.

Suicide rates tend to increase with increasing levels of deprivation. Māori and Pacific people living in deprived areas appear particularly vulnerable to suicide. The findings on the impact of rurality on suicide rates have been mixed in developed countries (Smith et al., 2008). In Australia, the UK, Ireland, New Zealand, and Canada, higher suicide rates in males were observed in rural and remote populations (Page et al., 2007; Middleton et al., 2003; Kelleher et al., 2002; DesMeul et al., 2006). Female suicide rates, on the other hand, were similar in both rural/remote and urban populations (Lagacé et al., 2007). In the UK, people living in urban regions were found to be more likely to suffer poorer physical and mental health than rural populations and had a higher rate of psychiatric disorders (Harriss and Hawton, 2011). A more recent, large study of suicides in the UK between 2006 and 2014 demonstrated via spatial mapping that area-level social fragmentation, deprivation, and rurality were associated with increased risk of suicide (Grigoroglou et al., 2018).

Rates of SH in rural areas have been compared with those in urban areas overseas and suggest that rates of hospital-treated SH are higher in deprived urban areas compared to rural districts; deprivation rather than social fragmentation had a stronger effect on the rates of SH in Ireland (Corcoran et al., 2007). In Finland, rates of SH were higher in urban areas compared with rural areas (Ostamo et al., 1991). Higher rates of SH were noted in urban areas of Oxford compared to rural areas (Bancroft et al., 1975; Harriss and Hawton, 2011). In New Jersey, USA, SH rates were higher in high-density centres of

rural districts and urban centres (Hempstead, 2006). These effects may reflect the fact that hospital services are typically located in urban centres, leading to undercounting of rural SH cases. O'Farrell et al. (2015) investigated the impact of travel times to the nearest hospital for hospital-treated SH and found that those living at greater distances from hospitals may not seek treatment for SH.

In New Zealand, Gallagher et al. (2008) reported that those employed in agriculture, fisheries, and forestry had higher suicide rates compared to people in other occupations between 2001 and 2005. The age-standardised rate in the farming group was 131 per 100,000, second only to trades workers who had a rate of 170 per 100,000. Possible reasons for the higher suicide rates in this group include geographic isolation, poor access to health care, little work-life balance, and dependence on weather and economic fluctuations. A more recent study of farm suicides in New Zealand by Beautrais (2018) reviewed coronial records between 2007 and 2015 and noted that about one third of farm suicides were in the dairy industry. Most of those who died by suicide were New Zealand Europeans (78%). One in five (21%) had a history of recent separation or divorce, and nearly one third were experiencing mental illness (29%). Other common stressors were relationship breakups (20%), conflicts and arguments (8%), physical health problems (12%), and acute alcohol and drug intoxication (3%). Nearly one in four (22%) had made a previous suicide attempt. There are relatively few studies of rurality in New Zealand; one study describing the epidemiology of SH in New Zealand across four district health boards (DHBs) (Counties Manukau DHB, Capital Coast DHB, Waitemata DHB, and Northland DHB) by Hatcher and colleagues (2009) did not report the impact of rurality. Several other studies about SH in New Zealand have not reported on the impact of rurality mainly due to these studies being conducted in metropolitan Auckland hospitals (Bennett et al., 2002; Tiatia and Coggan, 2001; Fortune, 2006).

Given that SH increases the risk of suicide and may lead to contact with hospital services, understanding the clinical profile of patients involved in SH in rural and urban areas may be one step towards reducing the rate of suicide in New Zealand. This study aims to investigate whether there are any differences in the demographics and clinical characteristics of patients presenting with SH who live in urban or rural areas.

2.1.1 Ethical Approval

The University of Otago Ethics Committee approved the study (H13/033), including consultation with Ngai Tahu for Māori responsiveness and Health Research South. This study was conducted at Southland Hospital, Invercargill, which is one of the hospitals of the Southern District Health Board. Consent from the patients was not sought because this study was an audit. This study did not receive any specific funding.

2.1.2 Objectives

The aims of this study were:

1. To compare rates of hospital presenting SH in the urban and rural populations of Southland, New Zealand.
2. To see if there were differences in the clinical profiles of the individuals presenting with SH to hospital from urban and rural areas to help inform clinical service delivery.

2.2 Methods

This study was conducted in Southland Hospital, Invercargill, New Zealand's southernmost planner, funder, and provider of public hospitals and health services. The catchment area has a rural and urban mix with a total population of 93,339, of which 19.2% (17,892) lives in rural areas (Statistics New Zealand, 2013).

The participants' primary addresses were geocoded by the Department of Injury Prevention Research Unit (IPRU), University of Otago, New Zealand. The NZ Ministry of Health has an address validation web service named 'Health-e-Address' or eSAM. It has been developed through the Health Identity programme. eSAM uses data from NZ Post, Land Information NZ, Statistics NZ, and the Ministry of Health to provide accurate and standardised address and geospatial data. There are seven urban/rural classifications, ranging from main urban areas (the most urban) to highly rural/remote areas (the most rural).

Table 1 provides the descriptors of the characteristics of urban/rural classification as defined by the New Zealand Ministry of Health, 2004.

Table 1
Descriptors of Characteristics of Urban and Rural Classification (NZ Ministry of Health, 2004)

Urban NZ	Rural NZ
1. Main urban area - Strong economic ties - Cultural and recreational interaction - Serviced from the core for major business and professional activities - An integrated public transport network - Significant workplace commuting to and from the central core - Planned development with the next 20 years as a dormitory area to or an extension or the central core	**4. Rural area with high urban influence** - Substantial proportion of the residents of that area work in a main urban area
2. Satellite urban communities - Small towns and settlements with strong links to main urban centres - 20% or more of residents' workplace in the urban area	**5. Rural area with moderate urban influence** - Significant percentage work in a main urban area
3. Independent urban communities - Towns or settlements without significant dependence on main urban centres - 20% or less of residents' workplace in the urban area	**6. Rural area with low urban influence** - Only a few working in main urban area, majority in rural areas
	7. Highly rural/remote area - Minimal dependence in urban areas

2.2.1 Study Design

This study was a retrospective file audit between 1st January 2011 and 31st December 2012. A data extraction sheet was developed (see Appendix A) in conjunction with Dr. Professor Paul Glue (lead supervisor) and Dr. John Canton (co-supervisor) to record the following information from each identified episode of SH:

- Demographic details: age, gender, ethnicity, living situation, education, occupation, and WINZ beneficiary.
- Rural or urban place of residence, based on geocoding of the primary address of the patient-provided address.
- Psychiatric diagnosis and psychiatric and medical comorbidities: DSM-IV primary and additional diagnoses, current treatment, family history of psychiatric illness, family history of suicide, and family history of SH were also included. Alcohol use, current or past abuse, and dependence were noted. Cannabis and synthetic cannabis use were also noted. Sexual abuse, physical abuse, history of violence to others or violence received, or any criminal record was included.

- The method of SH for the index episode: overdose, cutting, hanging, strangulation, shooting, gassing, and others (which includes jumping off a height, burning, crashing a car into a power pole, and drowning).
- Previous history of SH.
- Whether alcohol, cannabis, or synthetic cannabis was used in relation to the SH episode.
- An outcome of the assessment of the index SH episode coded as:
    - No follow-up offered,
    - Followed up by general practitioner (GP),
    - Followed up by mental health services and whether the patient attended or did not attend their appointments with the clinicians,
    - Hospitalisation (if the patient required medical or surgical admission to the medical ward, surgical ward, critical care unit, or the mental health inpatient unit as a result of the index SH).

2.2.2 Study Population

All patients who presented to either the emergency department (ED) or the Southland Mental Health Emergency Team (SMHET) with an episode of SH between 1st January 2011 and 31st December 2012 were identified from the SMHET logbook. As per the policy of the Southern District Health Board, Southland Hospital, all individuals presenting to ED with SH were evaluated by the SMHET even if they were not admitted to either the medical ward or the mental health inpatient unit. The Information Technology (IT) department of the hospital provided a record of all the referrals from ED to SMHET for SH to see if any patient had been missed in the SMHET logbook. The consultation liaison (CL) nurse and doctor reviewed some patients who were admitted to an intensive or critical care unit after a SH attempt. The CL nurse was also a member of the SMHET and would cover the main hospital during the daytime. SMHET and the on call doctor would cover after hours, and any liaison work on the medical side.

2.2.3 Catchment Area

Southland Hospital is situated in Invercargill city with community clinics in Invercargill, Gore, and Queenstown. The Mental Health Services provides cover to people living in Invercargill city, Gore district, Queenstown Lakes district, and rural Southland. According

to the 2013 census, 93,339 people live in the Southland region. 55.39% live in Invercargill city; 12.89% live in Gore district; 30.24% live in Queenstown Lakes district, and 1.48 % live in rural Southland.

Southland Region within New Zealand. Source: Wikipedia.

The Southland region has 2.2% of New Zealand's total population, and 1.9% of the New Zealand Māori population live here (12th in size out of 16 regions in New Zealand). 20.6% of people in Southland are under 15 years (20.4% nationally). The median age for Southland people is 39.6 years compared to 38 years nationally. 89% of people in Southland are European/Pakeha (versus 74% nationally); 13% are Māori (versus 14.9% nationally); 2.1% are Pacific (versus 7.4% nationally); and 3.2% are Asian (versus 11.8% nationally). The rate of unemployment in people above 15 years is 4.7% in this area versus 7.1% nationally. Unemployment is higher among Māori aged 15 years and above (9.8% versus 15.6% nationally). Single parent families make up 14.7% of the population versus 17.8% nationally. The number of people living in each house in Southland is 2.4 versus 2.7 nationally. Southland has fewer Individuals with a formal qualification (70%) than the national average (79.1%) (Statistics New Zealand, 2013).

2.2.4 Data Entry and Statistical Analysis

Data were initially transcribed onto a paper data collection sheet from source documents by the author. This information was entered into an Excel spreadsheet. Data were analysed using summary statistics (counts, means, SDs). Comparisons were made for the following subgroups in the full Invercargill data set using Chi-square testing: Urban (Categories 1–3) versus Rural (categories 4–7; see Table 1).

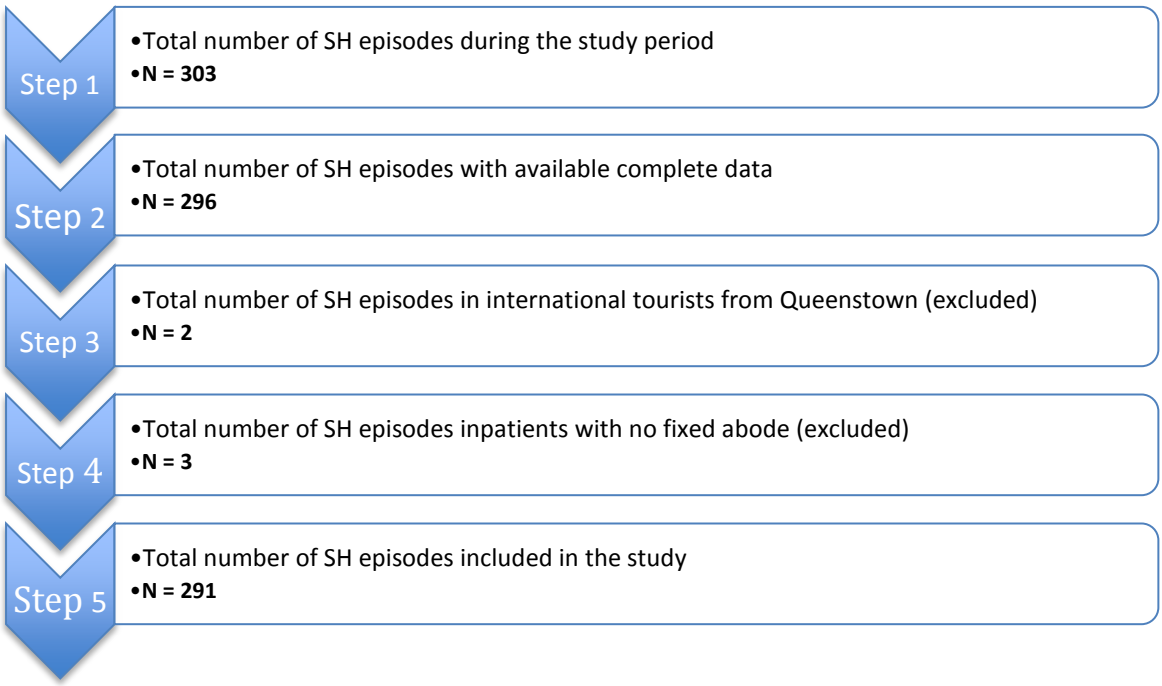
Some data may have been missed in the initial history by the clinicians but for the purpose of this study it was considered as absent. A second researcher, blind to coding decisions, did not recode the files and hence interrater reliability was not confirmed. This is a limitation in the study.

2.3 Results

Study Sample

All individuals aged nine years and above presenting with SH between 1st January 2011 and 31st December 2012 who attended ED or SMHET were included in the study. Participants with SH were included in the study sample if they were residents of the catchment area at the time of the SH episode. International tourists were excluded from the study (n = 2). Another three individuals with no fixed abode were excluded from the study because the study aimed to compare the differences in characteristics of SH in the urban and rural populations of the Southland region. In seven SH episodes during the study period, the individuals were intoxicated and left ED before the full assessment was completed. Due to incomplete information, they were excluded from the study.

Figure 1
SH Cases Included in this Study



Episodes versus individuals

As shown in Figure 1 and Table 2, a total of 246 individuals presented in the study period (1st January 2011–31st December 2012), accounting for 291 SH episodes. The majority of the individuals (n = 213, 86.6%) presented only once during the study period. 10.9% of the total sample (27 individuals) presented twice, and 1.2% presented with SH three times. Only two individuals (0.8%) presented four times, and one individual (0.4%) presented with 6 SH episodes. Of all the episodes, a past history of SH was present in 160/291 episodes (54.9%), even if it did not occur during the study period. Previous SH attempts included episodes whether or not they led to hospital admission.

Table 2
Individual Number of Episodes of SH

Number of SH Episodes	Individuals - N (%)
1	213 (86.6%)
2	27 (10.9%)
3	3 (1.2%)
4	2 (0.8%)
5	1 (0.4%)

2.3.1 Characteristics of the Entire Sample

The characteristics of the entire sample are presented in Table 3. The majority of those who presented with SH across the study period were Pakeha/European (n = 208, 71.5%), followed by Māori (n = 69, 23.7%). Individuals of other ethnicities (Filipino, Chinese, Indian, etc.) harmed themselves 14 times (4.8%). The median age of the total sample was 24 years. The interquartile range was 21. The majority of episodes were in those between the ages of 19 and 65 years (n = 216, 76.2%). There were only 8 SH episodes in people above 65 years of age (n = 8, 2.7%). Females outnumbered males (females n = 182, 62.5%; males n = 109, 37.5%) by a ratio of 1.7:1.

A total of 238 episodes of SH (82%) were among people of urban addresses, and only 53 episodes (18%) were noted in people from rural addresses. Half of the cases were single (53.3%), 30.6% were in a relationship, and in 47 episodes (16.2%), individuals were married. In 195 SH episodes, individuals lived with their whānau (67%) and in 95 episodes (33), individuals were living independently.

Table 3

Characteristics of the Entire Sample: All SH Episodes (n = 291) versus Individuals (n = 246)

Characteristics		SH Episodes		Individuals	
		N	%	N	%
Ethnicity	Pakeha/European	208	71.5	174	71.1
	Māori	69	23.7	57	23.6
	Others	14	4.8	15	5.3
Gender	Male	109	37.5	97	39.4
	Female	182	62.5	149	60.6
Age	9–18 years	67	23	59	24
	18–65 years	216	76.2	180	73.2
	65+ years	8	2.7	67	2.9
Residence	Urban	238	82	200	81.3
	Rural	53	18	46	18.7
Marital Status	Married	47	16.2	43	17.5
	Single	155	53.3	128	52
	In relationship	89	30.6	75	30.5
Living Situation	Whānau	195	67	164	66.7
	Independently	96	33	82	33.3

As shown in Table 4, the majority of adults presenting with SH were unemployed (n = 147, 67.8%) compared with those in part-time (n = 28, 12%) or full-time work (n = 59, 25.2%). The majority had achieved only school education: 153 SH episodes (65.4%) in 132 individuals (67%). Tertiary level education was noted in 81 SH episodes (34.6%) in 65 adults (33%).

Table 4

Comparison (SH episodes) and (SH in Individuals) of Education and Employment in Adults

Characteristics		SH Episodes		SH Individuals	
		N	%	N	%
Highest Education	School	153	65.4	132	67
	Tertiary	81	34.6	65	33
Employment	Working full-time	59	25.2	53	26.9
	Working part-time	28	12	24	12.2
	Unemployed	147	62.8	120	60.9

2.3.2 Demographics of individuals engaged in SH from Urban and Rural Areas

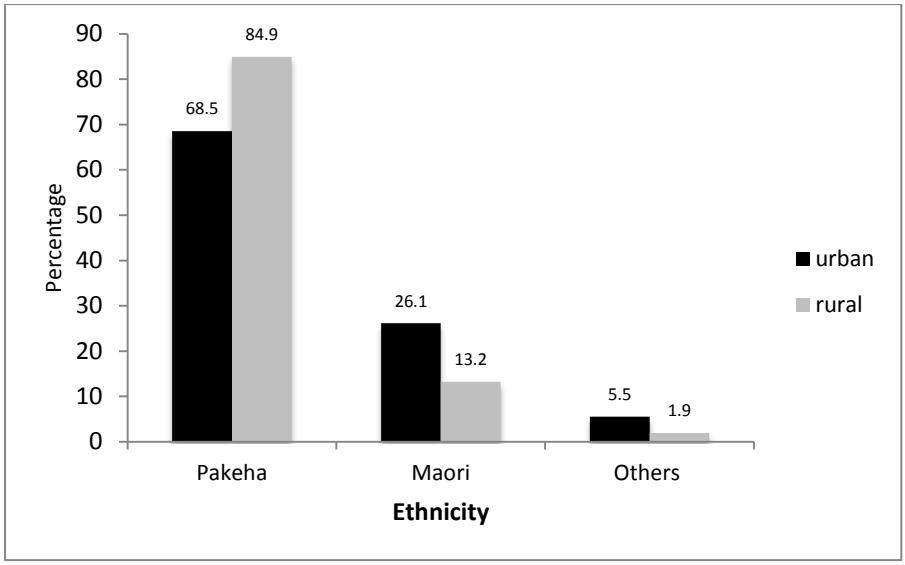
2.3.2.1 Ethnicity and SH

As shown in Figure 2; Table 2a in Appendix B, the majority of the patients presenting with SH both from urban and rural areas were of Pakeha/European ethnicity (n = 163, 68.5% in urban and n = 45, 84.9% in rural areas). Māori were slightly more likely to come from urban areas (26.1% versus 13.2%). Only a small number of individuals were of

another ethnicity: 5.5% in urban and 1.9% in rural areas. These results were not statistically significant. X^2 (2, N = 291) = 5.8, p = 0.054.

Figure 2

Ethnicity of Urban/Rural Populations Presenting with SH

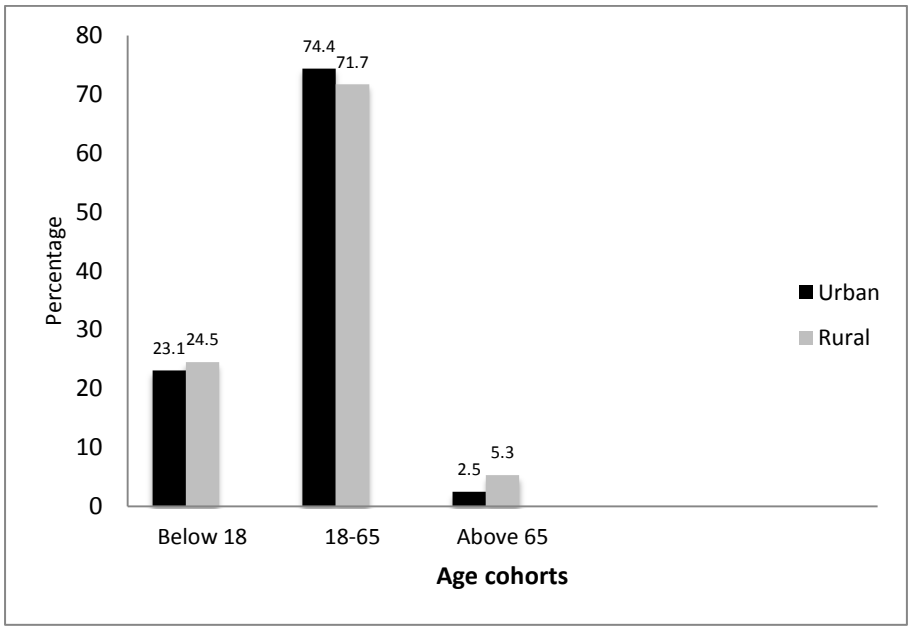


2.3.2.2 Age and SH

Participants with SH from urban areas ranged between the ages of 9 years and 81 years, with a mean age of 30.15 (SD = 14.61). The median age of urban SH was 25 years. Rural cases ranged from the ages of 13 years to 72 years. For rural SH, the mean age was 29.27 (SD = 15.23), with a median age of 24 years. The majority of SH episodes were between the age between 18 and 65 years (urban, n = 177, 74.4%; rural n = 38, 71.7%). Fifty-five SH episodes (23.1%) were noted in the age group below 18 years in the urban population, and 13 SH episodes (24.5%) in the rural population, as shown in Figure 3; Table 2a in Appendix B.

Figure 3

Age Cohorts of Urban/Rural Populations Presenting with SH

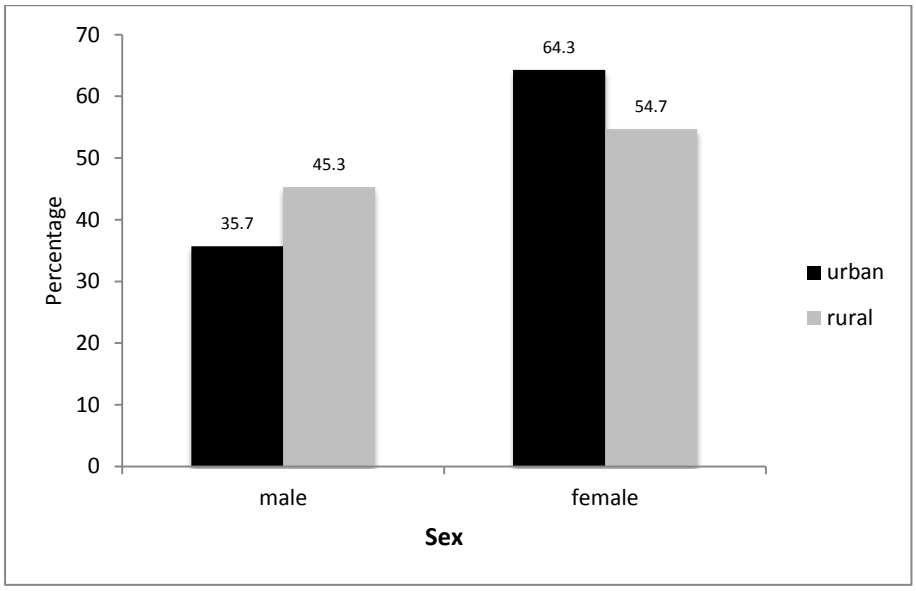


2.3.2.3 Gender and SH

In both rural and urban areas, as shown in Figure 4; Table 2a in Appendix B, SH was more common in females than males. A comparison of episodes of SH by gender across rural and urban settings was not statistically significant, X^2 (1, N = 291) = 1.69, p = 0.19.

Figure 4

Gender of Urban/Rural Populations Presenting with SH



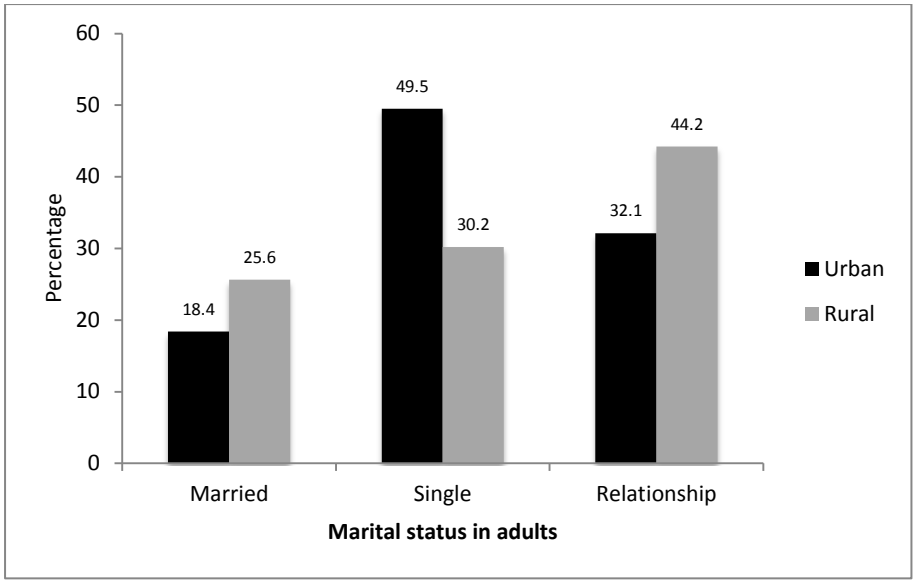
2.3.2.4 Marital Status and SH

As shown in Figure 5; Table 2a in Appendix B, in adults, almost half of the urban participants were single (n = 94, 49.5%). Rural participants with SH were slightly more

likely to be in a relationship (n = 19, 44.2%). This distribution was not statistically significant X^2 (1, N = 291) = 5.23, p = 0.07.

Figure 5

Marital Status of Urban/Rural Adult Populations Presenting with SH

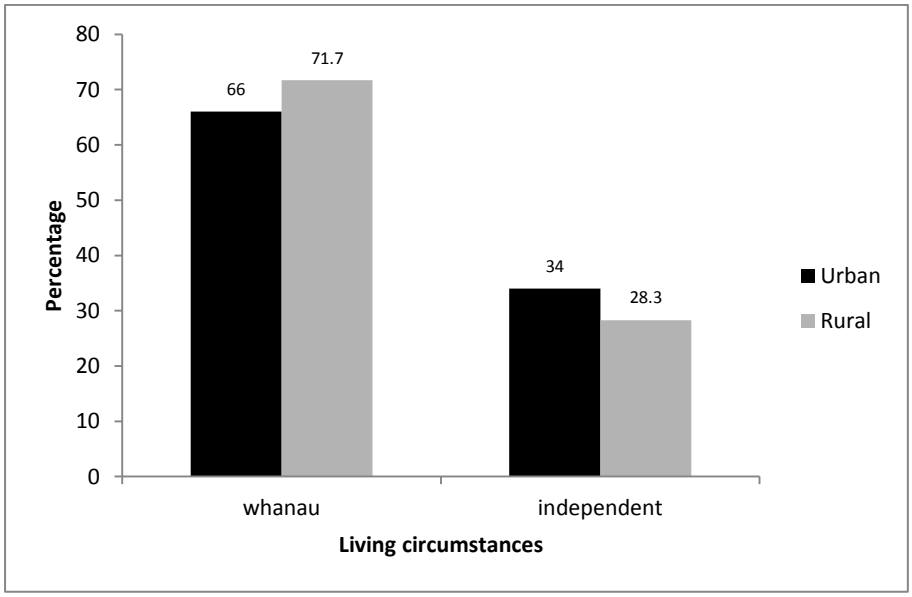


2.3.2.5 Living Circumstances and SH

Most participants lived with whānau (family) (urban, n = 157, 66%; rural, n = 38, 71.7%). Few participants presenting with SH lived independently (urban, n = 81, 34%; rural, n = 15, 28.3%), as seen in Figure 6; Table 2a in Appendix B. The distribution was not statistically significant, X^2 (1, N = 291) = 0.64, p = 0.42.

Figure 6

Living Circumstances in Urban/Rural Populations Presenting with SH

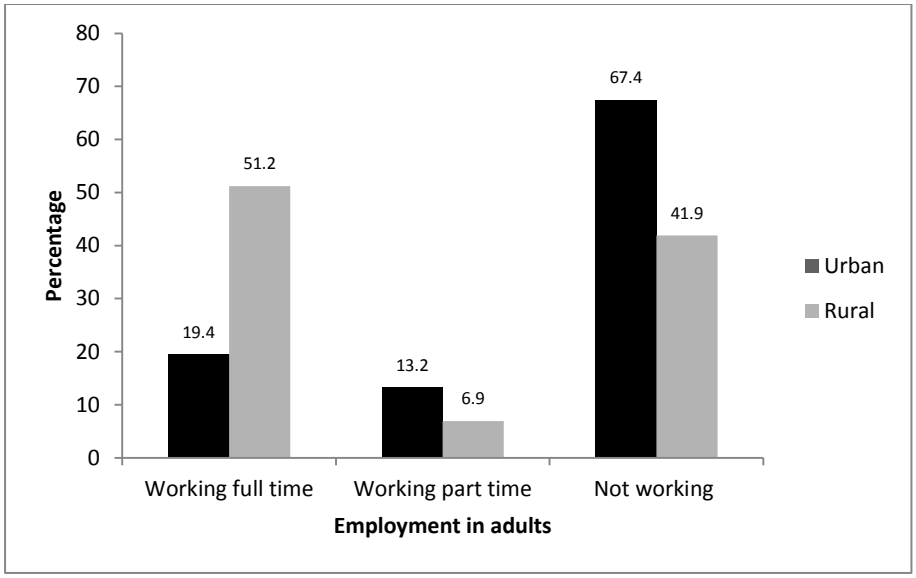


2.3.2.6 SH and employment status

The majority of the urban adult patients presenting with SH were unemployed (n = 128, 67.4%), whereas approximately half of the rural adult patients presenting with SH were in full-time employment (n = 22, 51.2%), as shown in Figure 7; Table 2a in Appendix B. Distribution of employment circumstances was statistically significant across urban and rural populations, X^2 (2, N = 291) = 18.6, p = 0.00

Figure 7

Employment Status in Urban/Rural Populations Presenting with SH

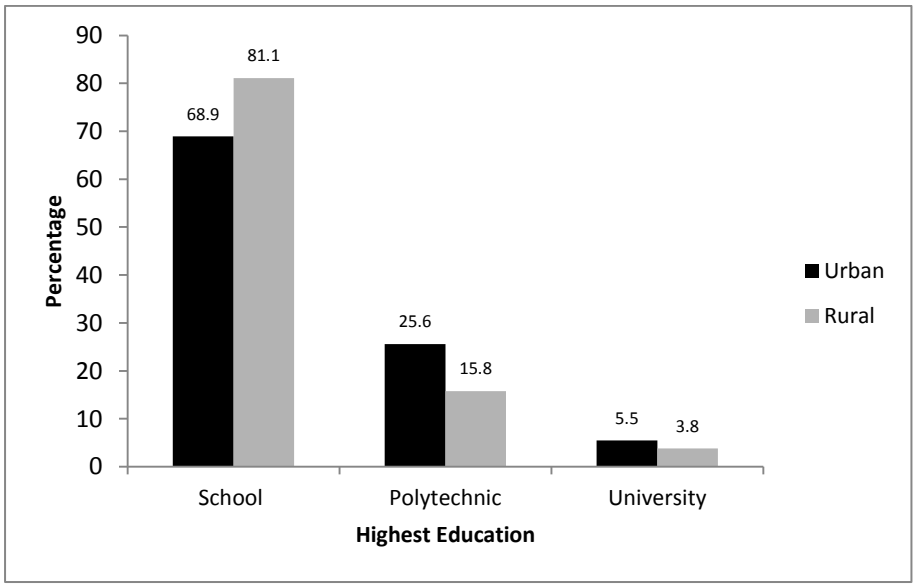


2.3.2.7 SH and the Highest Level of Educational Achievement

As shown in Figure 8; Table 2a in Appendix B, the majority of participants presenting with SH had school education (urban: n = 164, 68.9%; rural: n = 43, 81.1%). Due to the nature of the semi-structured forms, it was not mentioned which grade at school was achieved or whether the individual had finished high school or not. Tertiary education was noted more in participants with SH from urban areas (n = 74, 31.1%) compared to participants with SH from rural areas (n = 10, 18.9%). This distribution was not statistically significant X^2 (2, N = 291) = 3.15, p = 0.07.

Figure 8

Highest Level of Education in Urban/Rural Populations Presenting with SH

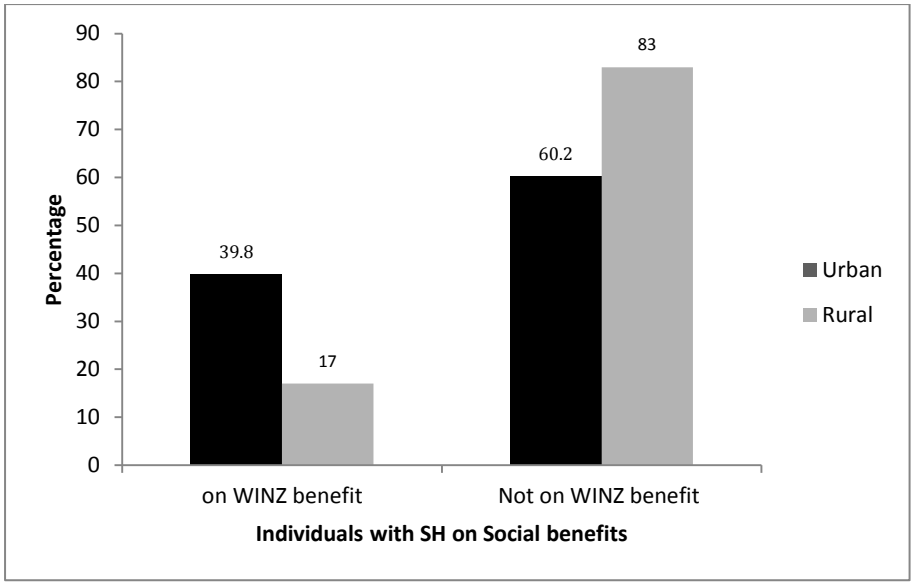


2.3.2.8 SH and WINZ (Work and Income New Zealand) Benefits

More urban participants presenting with SH were on a WINZ benefit (n = 94, 39.8%) as compared to rural patients (n = 9, 17%) as shown in Figure 9; Table 2a in Appendix B. This distribution was statistically significant, X^2 (1, N = 291) = 9.81, p = 0.00.

Figure 9

SH and WINZ Benefit Status in Urban/Rural Populations Presenting with SH



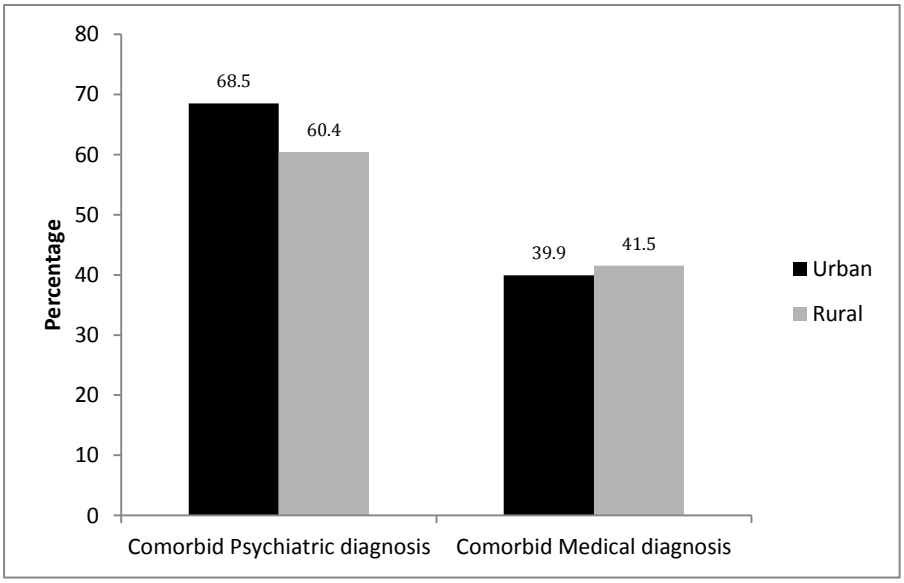
2.3.3 Clinical Characteristics of Patients Engaging in SH in Urban and Rural Areas

2.3.3.1 Co-Morbid Psychiatric and Medical Diagnosis in Patients Engaging in SH

Psychiatric co-morbid diagnoses were frequently seen in both urban (n = 163, 68.5%) and rural (n = 32, 60.4%) populations, as shown in Figure 10; Table 2b Appendix B. This distribution was not statistically significant, X^2 (1, n = 291) = 1.29, p = 0.025. Medical co-morbidities were also seen in almost 40% of patients presenting with SH (urban n = 95, 39.9%; rural n = 22, 41.5%).

Figure 10

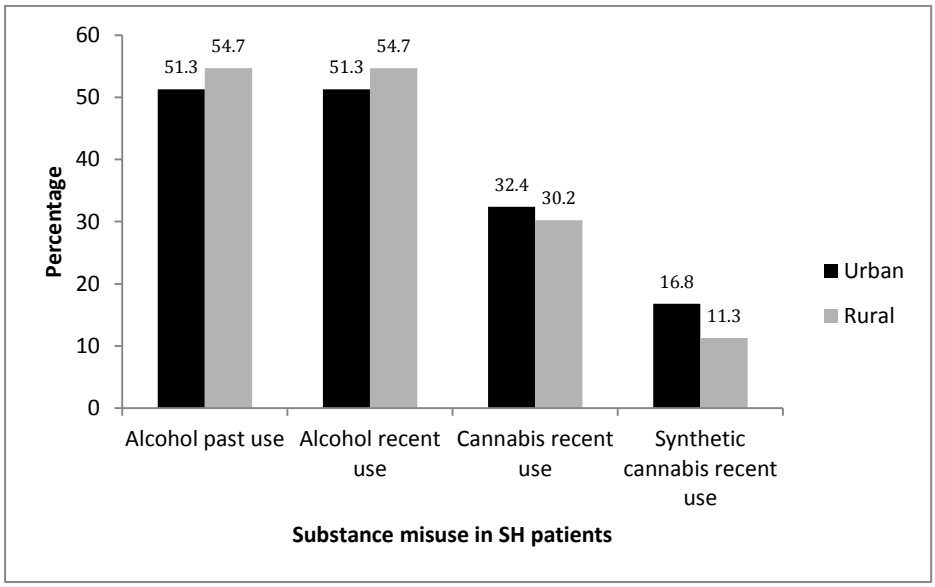
Co-Morbid Disorders in Urban/Rural Populations Presenting with SH



2.3.3.2.i Substance use and SH

As shown in Figure 11; Table 2c in Appendix B, recent alcohol use was present in about half of the participants presenting with SH from both urban (n = 122, 51.3%) and rural areas (n = 29, 54.7%). Recent cannabis use was present in about one third of the participants with SH in urban (n = 77, 32.4%) and rural areas (n = 16, 30.2%). The use of synthetic cannabis use was noted in some participants from urban (n = 40, 16.8%) and rural areas (n = 6, 11.3%). Past alcohol use was noted in about half of the participants with SH from both urban (n = 122, 51.3%) and rural areas (n = 29, 54.7%).

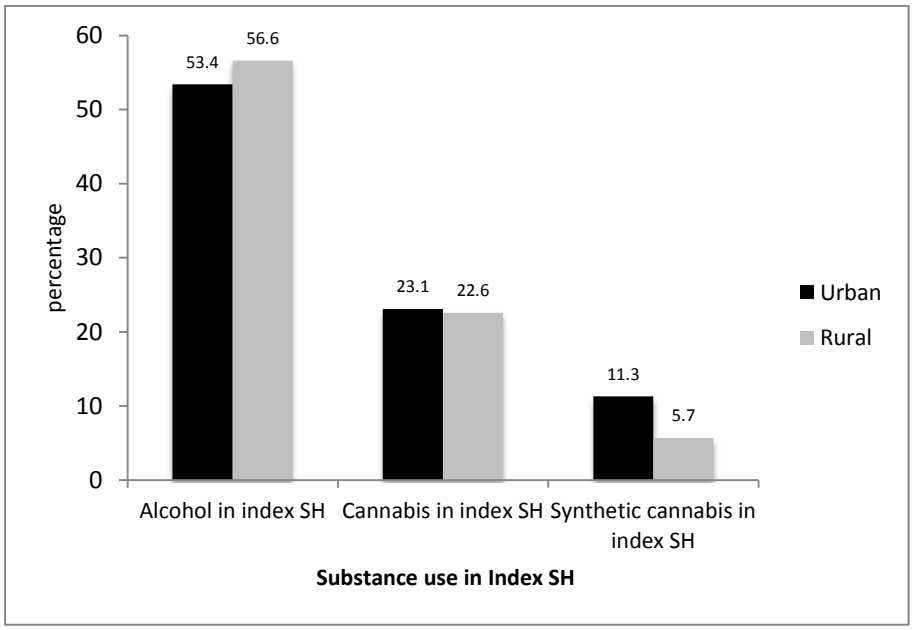
Figure 11
Substance use Disorders in Urban/Rural Populations Presenting with SH



2.3.3.2.ii Substance use in Index SH

Alcohol was used in more than half of the index SH episodes in both urban (n = 127, 53.4%) and rural (n = 30, 56.6%) participants. This information is shown in Figure 12; Table 2c in Appendix B. Cannabis was used in almost a fifth of the index SH episodes (urban n = 55, 23.1%; rural n = 12, 22.6%). The distribution was not statistically significant between the urban and rural populations, X^2 (1, N = 291) = 0.0053, p = 0.094. The use of synthetic cannabis was more frequent in the urban sample (n = 27, 11.3%) compared to participants with SH from rural areas (n = 3, 5.7%), but not significantly so.

Figure 12
Substance use in Index SH Episode in Urban/Rural Populations



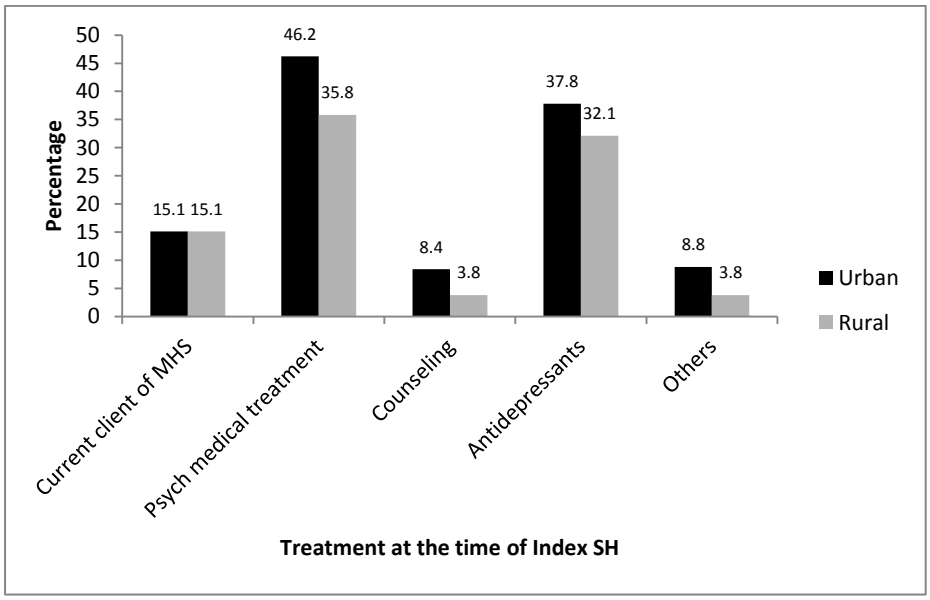
2.3.3.3 Treatment used at the Time of Index SH

At the time of the index SH episodes, a small number of participants were current clients of mental health services (urban n = 36, 15.1%; rural n = 8, 15.1%). This information in shown in Figure 13; Table 2b in Appendix B. A greater proportion of the urban participants (n = 110, 46.2%) were receiving psychiatric medical treatment at the time of the SH episode as compared to rural participants (n = 19, 35.8%). Counselling was being accessed by only a small number of participants (urban n = 20, 8.4%; rural n = 2, 3.8%) at the time of the index episode.

The most common medications being used were of the antidepressant class (urban n = 90, 37.8%; rural n = 17, 32.1%, X^2 (1, N = 291) = 0.614, p = 0.433). Other medications commonly used were antipsychotics, mood stabilisers, and anxiolytics, which together were seen in a few of the participants with SH (urban n = 21, 8.8%; rural n = 2, 3.8%, X^2 (1, N = 291) = 1.51, p = 0.21).

Figure 13

Treatments at the Time of Index SH Episode in Urban/Rural Populations

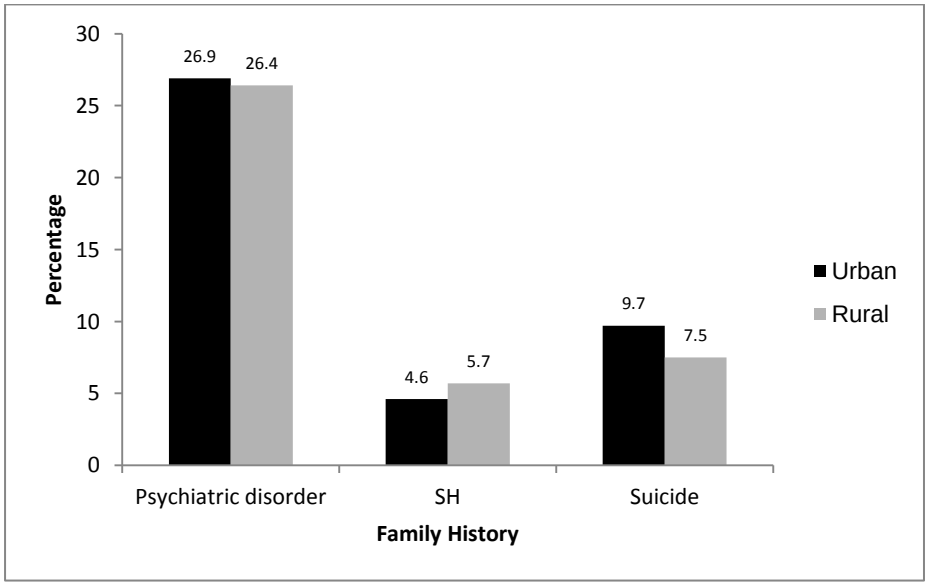


2.3.3.4 Family History of Psychiatric Disorders, SH, and Suicide

As shown in Figure 14; Table 2b in Appendix B, a family history of psychiatric disorder was reported in about one-fourth of SH episodes in participants from both urban (n = 64, 26.9%) and rural (n = 14, 26.4%) areas. A positive family history of suicide was seen in almost similar numbers in urban (n = 23, 9.7%) and rural (n = 4, 7.5%) participants with SH, and SH was noted in a small number (urban n = 11, 4.6%; rural n = 3, 5.7%).

Figure 14

Family History of Psychiatric Disorder, SH, and Suicide in Urban/Rural Populations Presenting with SH

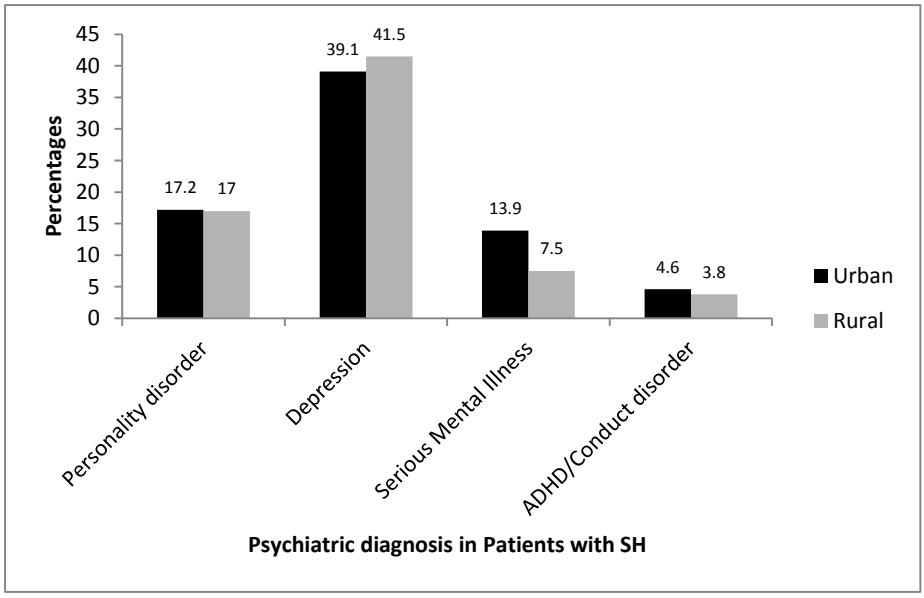


2.3.4 Co-Morbid Psychiatric Disorders in SH

Of the psychiatric co-morbidities, depression was most common in both urban (n = 93, 39.1%) and rural populations (n = 22, 41.5%). This information is shown in Figure 15; Table 2d in Appendix B. The second most common disorder noted was personality disorder (urban n = 41, 17.2%; rural n = 9, 17%). Serious mental illness (comprising schizophrenia, bipolar disorder, anxiety disorders, and eating disorders) was under represented (urban n = 33, 13.9%; rural n = 4, 7.5%). Childhood psychiatric disorders (including ADHD conduct disorder, and oppositional defiant disorder) were low in numbers in both urban (n = 11, 4.6%) and rural (n = 2, 3.8%) participants with SH.

Figure 15

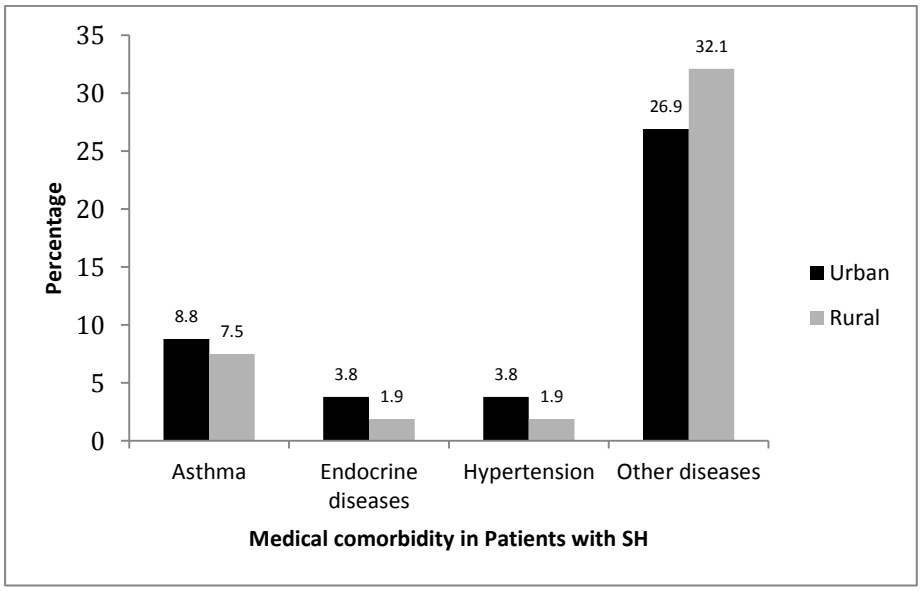
Psychiatric Co-Morbidity in Urban/Rural Populations Presenting with SH



2.3.5 Co-Morbid Medical Disorders in SH

Asthma was present in both participants from urban (n = 21, 8.8%) and rural (n = 4, 7.5%) areas. A small number of urban (n = 14, 5.9%) and rural (n = 2, 3.8%) participants had endocrine disorders (diabetes mellitus and thyroid dysfunction), as shown in Figure 16; Table 2e in Appendix B. It was not statistically significant X^2 (1, N = 291) = 0.371, p = 0.54) 0.054. Other medical disorders occurred with similar frequency in urban (n = 64, 26.9%) and rural (n = 17, 32.1%) participants. There was no statistical significance (X^2 (1, N = 291) = 0.58, p = 0.44).

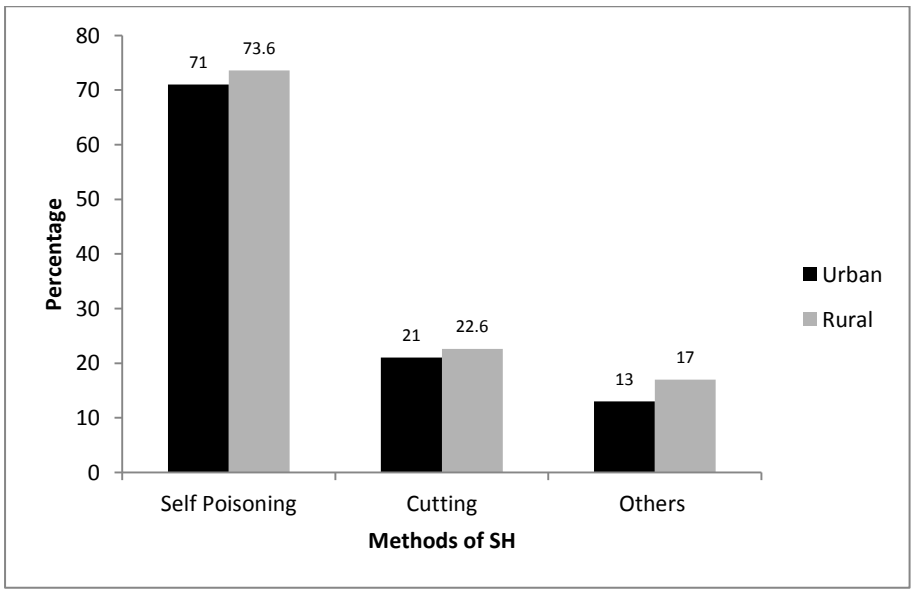
Figure 16
Medical Co-Morbidity in Urban/Rural Populations Presenting with SH



2.3.6. Methods Used in the Index SH

As shown in Figure 17; Table 2f in Appendix B, self-poisoning (either prescription medicine, over the counter medicine, or ingestion of gases) was the most common means used for SH (urban n = 169, 71%; rural n = 39, 73.6%), followed by cutting (urban n = 50, 21%; rural n = 12, 22.6%). Other methods included hanging, gunshot injuries, strangulation, and drowning, noted in 31 urban SH episodes (13%), and nine rural SH episodes (17%), X^2 (1, N = 291) = 0.57, p = 0.44.

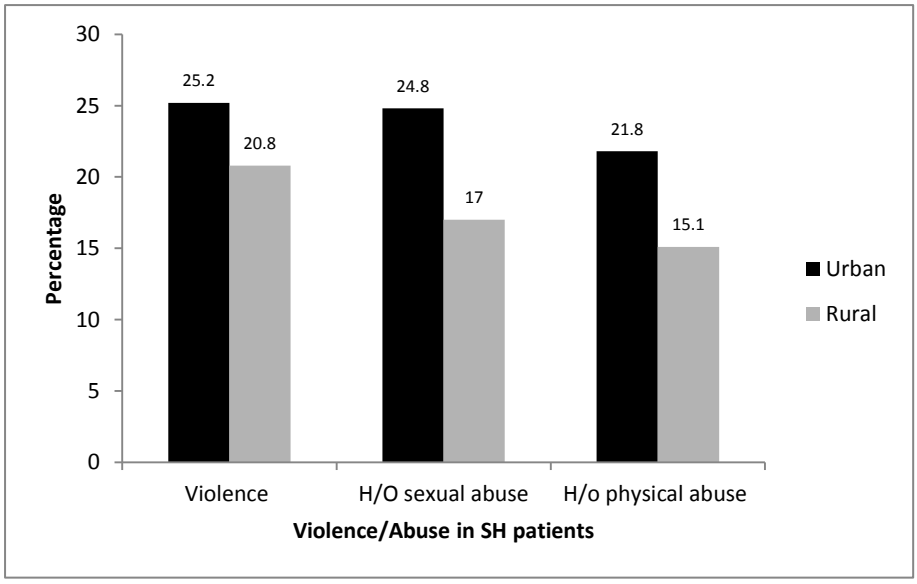
Figure 17
Methods of SH in Urban/Rural Populations Presenting with SH



2.3.7 Violence and Abuse in SH

Violence was noted in similar proportions of SH episodes in both urban (n = 60, 25.2%) and rural populations (n = 11, 20.8%). This information is shown in Figure 18; Table 2g in Appendix B. A history of sexual abuse (n = 59, 24.8 %) or physical abuse (n = 52, 21.8%) was numerically greater in patients presenting with SH from urban areas compared to rural areas, although these are likely underestimates. Distribution of reported violence and abuse were not statistically significant across urban and rural populations (violence: X^2 (1, N = 291) = 0.47, p = 0.49; sexual abuse: X^2 (1, N = 291) = 1.47, p = 0.22; physical abuse: X^2 (1, N = 291) = 1.20, p = 0.27).

Figure 18
Violence/Abuse in Urban/Rural Populations Presenting with SH



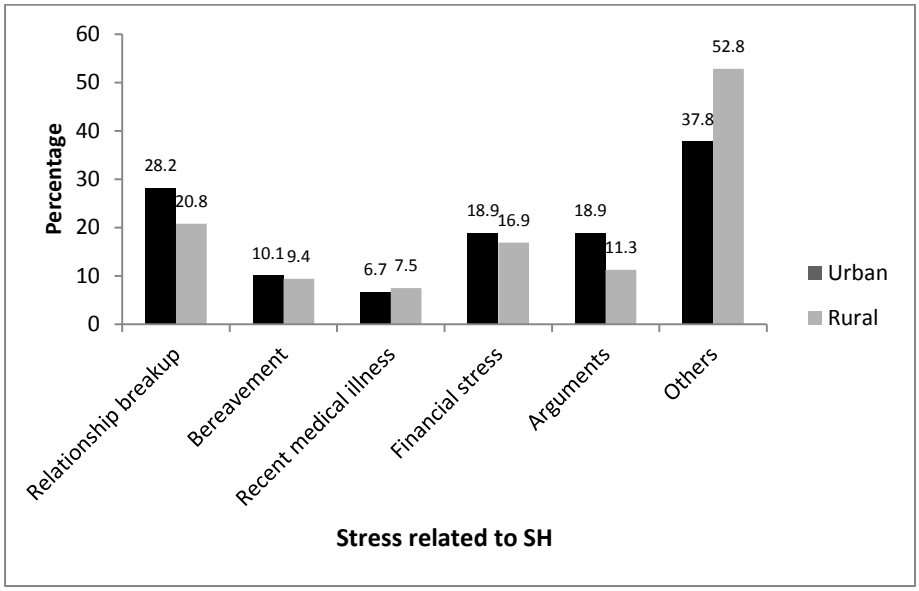
2.3.8 Stressors Related to the Index Episode of SH

As shown in Figure 19; Table 2h in Appendix B, relationship breakup was the most common proximal stressor noted, and was more likely among urban (urban n = 67, 28.2%) than rural patients (n = 11, 20.8%, X^2 (1, N = 291) = 1.20, p = 0.27). There was only a minimal difference noted in bereavement (urban n = 24, 10.1%; rural n = 5, 9.4%) and recent medical illness (urban n = 16, 6.7%; rural n = 4, 7.5%) as a stressor related to the index SH in both urban and rural populations. No statistical difference was noted with bereavement (X^2 (1, N = 291) = 0.02, p = 0.886) or medical illness (X^2 (1, N = 291) = 0.04, p = 0.83) as a stressor in urban and rural presentations. Financial stress due to job loss (urban n = 45, 18.9 %; rural n = 9, 17.0%) was similar in both the urban and rural SH

presentations (X^2 (1, N = 291) = 0.11, p = 0.744). Arguments (urban n = 45, 18.9%; rural n = 6, 11.3%) were noted more frequently among the urban population (X^2 (1, N = 291) = 1.73, p = 0.18).

Figure 19

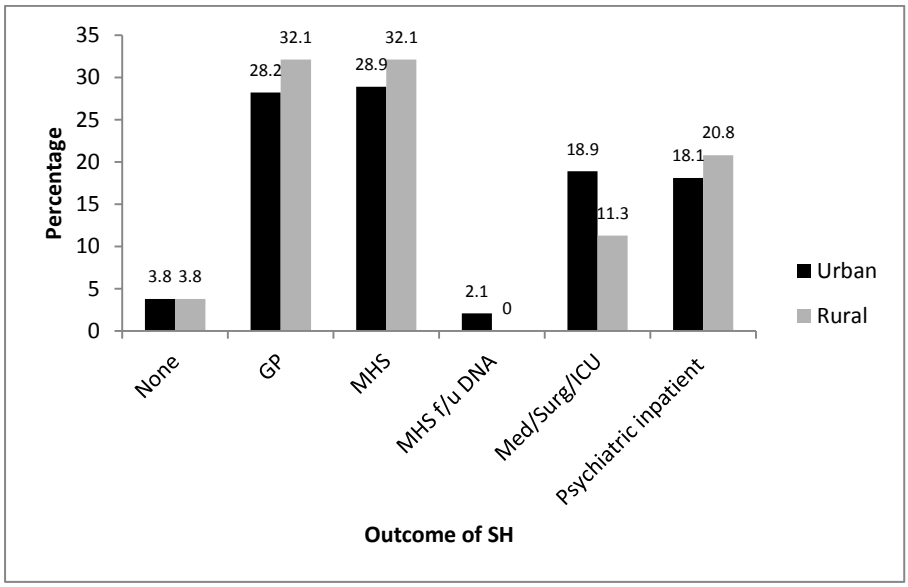
Stressors in Urban/Rural Populations Presenting with SH



2.3.9 Outcome of Index SH

Most patients were offered a follow-up of some sort, with only a small number not offered any follow-up (urban, n = 9, 3.8%; rural, n = 2, 3.8%). This information is shown in Figure 20; Table 2i in Appendix B. GP referral was the most common follow-up arrangement (urban, n = 67, 28.2%; rural, n = 17, 32.1%). One in seven SH episodes required admission to the intensive care unit, medical, or surgical units (urban n = 45, 18.9%; rural n = 6, 11.3%). A similar number of patients required admission to the mental health unit (urban n = 43, 18.1%; rural n = 11, 20.8%). Nearly one third of patients were followed up by mental health services as outpatients (urban n = 69, 28.9%; rural n = 17, 32.1%). Based on the data available, it appears that very few individuals who were offered follow-up appointments did not attend after the SH attempt (urban, n = 5, 2.1%, rural n = 0).

Figure 20
Outcome of SH in Urban/Rural Populations Presenting with SH



2.3.10 Repetition of SH

Approximately 14% of patients had a repeat episode of SH during the two-year data collection period, of which 10.9% presented with at least one repeat SH, and a very small number of patients (2.4%) presented with more than one episode. The majority of individuals with repeat attempts were female (63.6%), unemployed, and engaged in mainly self-poisoning as a means of SH. Compared with patients with single episodes of SH, factors more commonly seen in those individuals with multiple representations were presence of a psychiatric disorder: depression (45.5% vs 37.6%) and borderline personality disorder (21.2% vs 9.8%). Due to the small number of patients with repeat SH, these results were not analysed further.

2.4 Discussion

This retrospective file audit of patients attending Southland Hospital, Invercargill, during the study period found that a total of 246 individuals presented with 291 SH episodes. Nearly three quarters of those presenting were European/Pakeha. Females outnumbered males and were more likely to be from urban areas. Around three-fourths of the total SH episodes were noted among those between 19 and 65 years. Of those who presented with SH, there were more unemployed adults than employed adults, and the majority of the adult population had only school education. Almost half of urban SH was noted in single adults. Of co-morbid psychiatric diagnoses, which were present in

both urban and rural populations, depression was the most frequent, and antidepressants were most commonly being used. Self-poisoning was the most common SH method. Alcohol was used in more than half of the SH episodes, and relationship breakups were the most common stressors preceding the index SH. About one third of SH episodes were followed up by GPs, one third by mental health services as outpatients, and one third required admission to the medical, surgical, intensive care unit, or the mental health unit.

In this study, urban SH was higher (82% in urban, 18% in rural) compared to the rural population, as seen in a number of other studies (Corcoran et al., 2007; Harriss and Hawton, 2011). The high rate of SH in urban populations in Invercargill could reflect the effect of proximity to healthcare services, as has been shown in the National Registry Study in Ireland (O'Farell et al., 2015), where proximity to hospital services influenced SH incidence. O'Farell et al. have suggested that the distance decay effect, which is primarily an expression of healthcare utilisation, should not be interpreted as an indicator of healthcare need. Harriss and Hawton (2011) noted that the rates of deliberate SH in urban districts of Oxfordshire in the UK was higher than in rural districts in males and females aged between 15 and 64 years, and socio-economic deprivation and social fragmentation did not influence the rates of SH. Niskanen et al. (1975) noted that the ratio of individuals admitted to hospital due to attempted suicide from urban and rural areas in Eastern Finland was the same.

Travel times were not taken into consideration in this study. Due to the large distances in rural Southland, it is possible that some rural patients present to their local GPs rather than travel to the hospital, so the apparent number of presentations to Southland Hospital are lower among those living in rural addresses. Cost may be another factor. In New Zealand, a visit to the GP may be relatively expensive compared with free emergency hospital care. Cost may limit the utilisation of primary health care, particularly in socially deprived communities (Barnett et al., 2000).

Ethnicity and SH

In New Zealand, Māori bear a disproportionate burden of poor health (Ministry of Health, 2012), including elevated rates of mental health disorders (Wells et al., 2006; Baxter et al., 2006). Conversely, contact with health services has been shown to be

lower for Māori (Robson and Harris, 2007). Nationally, the age-standardised rate for intentional SH hospitalisation for Māori was 197.7 per 100,000 population of Māori compared to 172.2 per 100,000 non-Māori (Ministry of Health, 2013).

Relatively high rates of suicidal behaviour have been noted among indigenous people in most countries, including in America, the Arctic region, Australia, and New Zealand (Fortune and Hawton, 2007). In a household survey in New Zealand**,** Beautrais et al. (2006) noted that Māori and Pacific participants reported higher rates of suicidal ideation, plans, and attempts in the previous 12 months than non- Māori and Pacific particpants. Higher rates of SH among Māori likely reflect the complex effects of colonisation in New Zealand including dispossession of land, language, social deprivation, and disadvantage (Beautrais et al., 2005).

In this study, though more Pakeha/European from both urban (68.5%) and rural (84.9%) areas presented to the Southland Hospital compared to Māori (urban 26.1%; rural 13.2%), there was a much higher percentage presentation among Māori compared to the percentage of Māori in the local population. Māori population residing in the Southland region is only 1.9% of New Zealand's total Māori population, and it ranks 12th in size out of the 16 regions in New Zealand (Stats NZ, 2013). Similar findings have been noted in other district health boards (Waitemata DHB, Counties Manukau DHB, Northland DHB, Capital Coast DHB) in New Zealand (Hatcher et al. 2009).

Sociodemographic Correlates and SH

Among the urban population in this study, SH was noted to be more frequent in females, who tended to be single, unemployed, and with fewer educational qualifications. SH in females outnumbered males in the rural population too. Being in a relationship did not seem to make a difference in SH episodes in the rural group. Unemployment and school education were most common in the sample for those under 25 years. Similar 'gender paradox' and sociodemographic correlates have been noted in other studies as well (Harriss and Hawton 2011; Beautrais et al., 2005; Collings and Beautrais, 2005; Hawton and van Heeringen, 2000; Suicide Prevention Australia, 2015).

Family History in SH

In the present study, a positive family history of SH was noted only in 4.8% of the episodes. This count is based on the recorded history in the file and is likely an under

representation. Suicide and suicidal behaviour is highly familial, and is transmitted independently from the familial transmission of psychiatric disorders per se (Brent and Mann, 2005). A family history of suicidal behaviour is associated with suicidal behaviour in the proband, even after adjusting for the presence of psychiatric disorders in the proband and family. This indicates a transmission of attempt, which is distinct from family transmission of psychiatric disorder. Impulsive aggression and environmental factors such as abuse imitation or transmission of psychopathology have been associated with an increase in suicidal behaviours in the family (Brent and Mann 2005). In a 2012 New Zealand student survey, there was a higher risk of SH in those who had been exposed to suicide attempts or death by suicide among friends and/or family members (Chan et al., 2018).

Psychiatric Co-Morbidity

In the present study, co-morbid psychiatric diagnoses were noted in the majority of SH episodes (66.9%). There was no real difference between rates of psychiatric co-morbidity in urban (68.5%) and rural populations (60.4%) presenting with SH. Depression was the most common psychiatric co-morbidity in this sample (approximately 40% in both urban and rural populations). Borderline personality disorder and alcohol dependence were recorded in around 10% of SH presentations. Personality disorders have been frequently seen as co-morbid in adults who have self-harmed (Haw et al., 2001). Borderline personality disorder in this sample was noted in almost a quarter of those who had multiple attempts of SH (23.8%). Personality disorders increase the risk of SH (Krysinska et al., 2006). According to the Cochrane review (Hawton et al., 2016), cognitive behaviour therapy (CBT) based psychological therapy has resulted in fewer repetitions of SH. Dialectical behaviour therapy (DBT) is the most evaluated treatment for people with borderline personality disorder (NHMRC 2012), associated with a significant reduction of SH (Hawton et al., 2016; Linehan et al., 2006; Priebe et al., 2012; Verhaul et al., 2003), and CBT and DBT could be considered from a service delivery perspective in this area. Case management and remote contact interventions did not prove to be beneficial in reducing repetition of SH.

Substance use in SH

The prevalence of alcohol dependence among people presenting to hospital with SH was similar to other studies (Hawton et al. 1989), where it was seen in 15–50% of men and 5–15% of women. In this study, a history of alcohol dependence was noted in 10.9% of urban and 11.3% of rural SH episodes. Problem drug use has been related to SH presenting to hospitals (Haw and Hawton, 2011). It was present in 8.7% of patients and was more seen in males (13.6%) compared to females (5.3%). Another study (Giletta et al., 2012) involving three different countries indicated an association between SH and cannabis abuse in a sample from the United States, but not from the Netherlands and Italy. In this study, cannabis dependence was noted in 1.3% of SH episodes in the urban population, and polysubstance dependence was noted in 7.1% of SH episodes in then urban population, with none in the rural population.

Methods used for SH

In this study, the SH methods used were similar for rural and urban dwellers. As with previous studies, overdose was the most common form of SH (Hawton et al., 2003; Morgan et al., 1975; Loughlin and Sherwood, 2005). In this study, cutting was the second most common form of SH in patients presenting to hospital. Cutting was noted in 20% of all methods of non-fatal suicidal behaviours in Australia and over 14% in Italy and the Philippines (De Leo et al., 2013).

There has been concern about gun related suicide deaths in rural areas in New Zealand. In this study there were a small number of gun related SH episodes. One study found that gunshot injuries and gassing were only marginally more frequent in rural populations compared to urban populations. This could be due to more accessible access to firearms in the rural population or higher suicidal intent amongst rural individuals engaging in SH (Harriss and Hawton, 2011).

In this study, there was no significant difference in proportion of hanging events. This method is of concern due to its high fatality rate; more than half (54% men, 57% women) of the individuals who had attempted suicide by hanging, strangulation or suffocation committe suicide, and 87% did so in the first year after an index episode (Runeson et al., 2010). In New Zealand, hanging has been the most common method of suicide across gender, age, and ethnicity (Taylor and Colling, 2010). Methods used for

SH are very important as it has been shown that about a quarter of those who die by suicide had used the same method as that of the index attempt of SH(Runeson et al., 2010; Kuo et al., 2012); when self-poisoning was used for SH, the incidence rates for eventual suicide was the lowest (Kuo et al., 2012). Methods used for SH may also switch, and different methods may be used in subsequent SH. Patients who self-poison are less likely to switch methods than patients who use alternative methods (Owens et al., 2015). Hawton et al. (2020) have shown that switching methods between SH and suicide is common, especially self-poisoning to hanging or asphyxiation.

History of Sexual Abuse and SH

Sexual abuse of children can have a lasting impact on their development. Abuse in childhood has been shown to correlate with SH (Johnson et al. 2002; Fergusson et al. 2000; Dube et al. 2001). In a prospective study (Yeo and Yeo, 1993), a history of sexual abuse was noted in 7.8% of patients engaging in SH. In this study, almost a quarter of the SH episodes (23.5%) were associated with a history of sexual abuse, 14.3% were seen in the first attempt of SH, and 31.3% among those with more than three presentations of SH, suggesting that a history of sexual abuse along with other factors influenced repetition of SH.

Gladstone et al. (2004) studied 125 women with depressive disorders and found that women with a childhood sexual abuse history were more likely to have attempted suicide and/or engaged in deliberate SH. Path analysis confirmed the contributory role of childhood sexual abuse to SH and the significance of childhood physical abuse for recent interpersonal violence. Mental health services do not primarily provide treatment for childhood sexual abuse, and patients are managed by GPs and therapists paid for by ACC (Accident Compensation Corporation). This finding highlights the importance of inquiry into sexual abuse, and where applicable, intervention for sexual abuse among those presenting with SH.

Violence and SH

Boyle et al. (2006) studied SH in victims of domestic assaults and noted that there was an increase in the incidence of SH in these groups. There was a moderate correlation between the number of episodes of SH and number of assaults. This highlights the importance of screening for domestic violence in patients presenting with SH. In this

study, a history of violence was noted in between one fourth (urban) and one fifth (rural) of SH episodes.

Repetition of SH

Those with multiple SH attempts were primarily adults in the age range of 19 to 65 years and about two thirds were unemployed. A history was SH was noted in almost half of the individuals with multiple attempts, as reported in other studies (Haw et al., 2003; Hawton et al., 2012). Childhood sexual abuse was noted in one fourth of the sample, as seen in other studies (Haw et al., 2001; Vajda and Steinbeck, 2000). Frequent repetition of SH has been associated with personality disorders (Haw et al., 2001; Kreitman and Casey, 1988; Suominen et al., 2000). In the current sample, borderline personality disorder was noted in about one fifth of the sample and mostly in females.

2.5 Limitations

The main limitations of this study are the relatively small sample size and the use of existing data from clinical files creating reliance on the information available in the files as reported by various clinicians. The level of detail recorded regarding assessments varies between clinicians, although a standardised form was used within the service. The fact that certain data are not recorded cannot be equated with the absence of certain factors. An additional limitation is the absence of reliability checks. The characteristics of the clinical sample reflect the local population of Invercargill; although this is a good mix of the urban and rural population, there may be some variations according to the geographical area, and the referral and intake policies of the local setting, which affect the generalisability of the findings. There is also the possibility that the prior experience of those who presented to the hospital more than once in the study period may have had an impact on the way in which they report certain information.

2.6 Implications for Prevention of SH

Only a small number of patients presenting to ED following an episode of SH were known to have been under the care of local mental health services at the time of their index SH. Many patients presenting to hospital with SH were receiving some treatment from their GPs (primarily antidepressants). Medical co-morbidity was noted to be high

in patients with SH. It would be useful for patients seen in primary care to be screened for suicidal thoughts and intent, and for primary care providers to refer these patients to the mental health services or counsellors as appropriate.

Alcohol abuse was noted in more than half of the index SH episodes, and relationship difficulties were the most common stressor related to the index SH. Interventions to strengthen personal coping skills in children and adolescents appear to be most effective when indicated via those who theycome in contact with, such as school teachers, sports coaches and parents. Gatekeeper training for community leaders has also shown some promise (Burnette et al., 2015).

Self-poisoning (using prescription medications, over the counter medications, and gassing) was the most common means of SH. The prevention opportunities are likely different for over the counter medications compared with prescribed medications. For some patients, 'close control' prescription in primary care could be considered, although the possibility of 'stockpiling' always remains. Paracetamol compounds are freely available and cheap in New Zealand. Current work is underway to look more closely at the potential gains in reducing pack size, as has been implemented in overseas jurisdictions (Morgan and Majeed, 2005; Gorman et al., 2007).

Self-poisoning by carbon monoxide is a highly lethal method of suicide, which has been decreased in New Zealand as the vehicle fleet has modernised (S.Fortune, personal communication, 22.1.2020). However, a small number of presentations using this method were apparent in this sample.

Firearm injuries were seen more in the rural population with SH, which is not unexpected. The importance of firearm safe storage becomes an essential strategy. Clinicians who come in contact with rural patients should routinely enquire about firearms access and provide advice regarding safekeeping. Prevention of firearm suicide deaths may be a serendipitous outcome of the proposed amendments to the Arms Control Act before the Health Select Committee (S.Fortune, personal communication, 22.1.2020).

Hospital presentations for SH reflect only the tip of the iceberg; most acts of SH in the community lead to medical intervention via GP or hospitals. Support and advice via the

internet or social media and strengthening the non-governmental organisation (NGO) sector are possibilities outlined in the Mental Health Inquiry report (Ministry of Health: He Ara Oranga, 2018).

Strategies to prevent and reduce SH will strengthen strategies to prevent suicide in New Zealand. The current high rates of suicide in the country have been one of the reasons for the recent Mental Health Inquiry, and reducing New Zealand's suicide rates is one of the recommendations in the report released on November 2018 (Ministry of Health: He Ara Oranga, 2018).

2.7 Conclusion

This study did not find significant differences in the demographics and clinical characteristics between urban and rural patients presenting with SH. The definition of urban and rural used in the study is based primarily on population density and its connections to main centres. The urban and rural divide did not relate to poverty. The results of this study reflect only SH presenting to hospital, which helps in the allocation of resources and targeting interventions.

Chapter 3: Study 2: Self-Harm in Children and Youth Below 15 Years Presenting to Southland Hospital, Invercargill

3.1 Introduction

Suicide amongst children and adolescents remains a significant public health concern in New Zealand. In 2016, the most recent year for which standardised statistics for suicide are available, the highest rate of suicide was among youth aged 15–24 years (16.8 per 100,000). Over the ten years between 2006 and 2016, the rate of youth suicide has been variable, but it has been predominantly higher in this age group compared to other life-stage age groups. Before 2013, the youth rate of suicide was predominantly higher than the other age groups, but more recently, the rate for youth suicide has been similar to those for other age groups less than 65 years old (Ministry of Health, 2016).

In 2013, the most recent year for which standardised statistics for intentional SH hospitalisations are available, a total of 2,866 hospitalisations for SH were reported (456 per 100,000) for youth (15–24 years), of which three quarters were females. The highest rate of SH was among 15–19-year-old females (912.6 per 100,000) and for males, in those aged 20–24 years (229.8 per 100,000) (Ministry of Health, 2013). These figures underestimate the prevalence of SH in the community. Only about one in eight adolescents who SH present to hospital, more commonly those who overdose (Madge et al., 2008, Hawton et al., 2002b).

SH in young people is important clinically, not only because of its association with mental illness but also due to the increased risk of subsequent suicide (Skegg, 2005; Hawton et al., 2020). There is also a considerable risk of suicide, especially in males, older adolescents, and those who repeat SH (Hawton et al., 2020). SH in children and adolescents is a growing public health concern due to the psychological impact on the individual at the time of the act and also due to its long-term sequelae on the individual, family, and society. SH has been a growing phenomenon in adolescents, including the very young, particularly in girls (Hawton et al., 2003; Corcoran et al., 2004; Claassen et al., 2006). There is a risk for repeated SH and increased risk of suicide in the five years following presentation to the hospital (Carroll et al., 2014). SH is one of the strongest predictors of suicide, and reducing repetition of SH is of utmost importance (Ougrin et

al., 2012). Many adolescents who think about suicide do not make an attempt to kill themselves, but those who engage suicidal attempts have certain factors which increase the risk: cannabis use, other illicit substance use, exposure to SH, and certain personality factors (Mars et al., 2019).

Community Studies

Evans et al. (2005) conducted a systematic literature review on the prevalence of suicidal phenomenon in adolescents, including survey method, gender, and ethnicity (n = 128 studies comprising 513,188 adolescents). The mean proportion of adolescents who reported attempting suicide was 9.7% (95% CI, 8.5–10.9), with 29.9% (95%CI, 26.1–33.8) of adolescents thinking about suicide. Females outnumbered males. Muehlenkamp et al. (2012) conducted a review of studies on the prevalence of SH and non-suicidal self-injury (NSSI) in adolescents, NSSI being defined as deliberate, self-inflicted destruction of body tissue without suicidal intent for purposes not socially sanctioned. A mean lifetime prevalence of 18% (SD = 7.3) for NSSI behaviour and 16.1% (SD = 11.6) for SH was observed.

3.1.1 International Trends of Hospital-Treated SH

There have been numerous studies on the prevalence of SH in different countries, but due to different approaches used (such as sampling, instruments, and time frames) and different definitions, it is often difficult to compare estimates of the prevalence of SH in different countries.

Hawton et al. (2003) used data from the Oxford Monitoring System for Attempted Suicide to study the trends of SH in adolescents (12–18 years) who presented to hospital between 1990 and 2000. Children and adolescents below the age of 16 years accounted for about 5% of all SH referred to the hospital. Self-poisoning was noted in more than 90% of the episodes. There was an association of SH with school stress noted, as the presentations decreased during the school holiday periods.

Olfson et al. (2005) studied young people between the ages of 7 and 24 years presenting to emergency departments following SH from 1997–2002. Mental disorder was diagnosed in more than half (56%) of these presentations, including depressive disorders in 15.1% and substance use disorders in 7.3%. About half of the visits (56.1%)

required inpatient admission. The annual rate of the emergency visits with SH was 225.3/100,000.

Hawton and Harriss (2008) collected data on 710 consecutive under 15-year -old who had presented to a general hospital with SH in central England over 26 years (1978–2003). The female:male ratio was 6.5:1. Overdose using pills was most commonly seen (95.8%). A history previous SH was observed in 26.8% of the sample. Common problems associated with SH in children were relationship difficulties with family members (77.3%) and with friends (38.9%), and school/study problems (37.9%). SH in this age group was usually related to life problems and was generally of low suicidal intent; the long-term risk of suicide was low.

The Multicentre Study of Self-Harm in England (Hawton et al., 2012a) conducted an eight-year study (2000-2007) for SH in adolescents in six hospitals, and found that three quarters were female. The female:male ratio in 10–14-year-olds was 5:0, and in 15–18-year-olds, it was 2:7. The rates of SH were different in different age groups in males and females. In 10–14-year-olds, rates of SH in females were 302 per 100,000 (95% CI 269–335), and in males, 67 per 100,000 (95%CI 52-82). Among 15–18-year-olds, SH rates in females were 1,423 per 100,000 (95% CI, 1346–1501) and among males, 466 per 100,000 (95%CI 422–510). Repetition of SH was frequent. More than half of the sample (53.3%) had a history of prior SH, and 17.7% repeated SH within a year.

In a recent study by Geulayov et al. (2018), ratios of fatal to non-fatal SH were different in males and females, and between adolescents aged 12–14 and 15–17 years old. Adolescents who presented to hospital following non-fatal SH totalled 1,320,of which 78% (n = 1,028) were females and 74% (n = 977) were aged 15–17 years. In 12–14-year-olds, for every boy who died by suicide, 109 had presented to the hospital with SH. For every girl who died by suicide in this age group, 1,255 had attended the hospital with SH. In 15–17-year-olds, for every male suicide, 120 presented to the hospital with SH, and for every female suicide, 919 presented to the hospital with SH.

Ireland developed the first national registry for SH. Perry et al. (2012) studied the incidence and repetition of hospital-treated SH for seven years between 2003 and 2009. They found variation in SH incidence by age, with a peak rate in females aged 15–19 years (620 per 100,000; 95% CI: 605–636). In a recent study by this group (Griffin et al.,

2018) over ten years between 2007–2016, the peak rates were again observed among 15–19-year-old females (564 per 100,000). Rates of SH had increased by 22% overall and were more pronounced for females between the ages of 10 and 14 years, indicating that the age of onset of SH had been decreasing.

Even though SH presenting to hospital is only a small fraction of SH in the community, a study of this high-risk clinical group who present to hospital with SH will help identify the characteristics of children and adolescents who engage in SH at a young age, the associated precipitants, and risk factors. This is an essential step in the development of suicide prevention services.

3.1.2 Hospital-Treated SH in New Zealand

Bennett et al. (2002) reviewed patients presenting to the ED at an Auckland public hospital following an attempted suicide in European/Pakeha youth aged between 15 and 24 years. During one year, there were 212 presentations by 196 individuals. Presentations involving alcohol were more common during weekends, and involved cutting and piercing as a form of SH.

Gibb and Beautrais (2004) studied trends in admission to Christchurch Hospital in the Canterbury region for attempted suicide during ten years between 1993 and 2002. A total of 3,711 individuals were admitted. A significant increase in the number of female youth (< 25 years) admissions were noted, but not for male youth or youth overall. The authors noted that the proportion of admissions to hospital due to overdose had decreased during the study period and the proportion of admissions due to cutting/stabbing and other less common methods (like hanging, self-immolation, motor vehicle crashes, or jumping from a height) had increased, thereby highlighting that people were using more violent means to SH. The proportion of admissions for carbon monoxide poisoning had remained relatively static. Young people in New Zealand were resorting to more dangerous/violent means of SH, which explains hanging being the most common method of suicide in young people in New Zealand over a 20 year period between 1977 and 1996 (Beautrais, 2000b). In this study, exhaust gas was the second commonest means (18.2% of all youth suicides, 14.3% of male youth suicides, and 29% of female youth suicides). Self-poisoning was reported more in suicides in females (21.1%) compared with males (5.7%).

Hatcher et al. (2009) described the characteristics of the individuals presenting with intentional SH to four district health boards (DHBs) in New Zealand, and compared their findings to official data over 12 months. The four DHBs studied were Waitemata DHB, Counties Manukau DHB, Northland DHB, and Capital and Coast DHB. Though the age range for the individuals in the study was between 12 and 92 years, there was a skew noted towards younger age groups, with the greatest numbers seen below 20 years old. The largest numbers of females were aged 15–19 years (n = 276, 25.6%) and the largest number of males was also aged 15–19 years (n = 105, 19%). Twenty-three percent (n = 210) of New Zealand European/Pakeha were aged 15–19 years, and 26% (n = 82) of Māori were also aged 15–19 years. Annual rates per 100,000 populations by age group for females had a similar distribution in the four different DHBs, with the highest female rates in the 15–19 year age group (Northland DHB, n = 864; Capital and Coast DHB, n = 652; Waitemata DHB, n = 583; and Counties Manukau, n = 362). For the male subjects between 15 and 19 years, rates were variable across the four DHBs. The highest rate was noted in the Capital and Coast DHB (n = 222) and Waitemata DHB (n = 234). For Northland DHB, the highest rates were in the age group of 25–29 years (n = 272), and for Counties Manukau DHB (n = 209), the highest rates were seen in the age group of 30–34 years.

3.1.3 New Zealand Psychiatric Clinical Studies

In New Zealand, there have been few studies on SH among children and adolescents. Fortune et al. (2005) studied suicide behaviour to establish the prevalence of suicidal ideation and suicidal behaviour in children and adolescents. They conducted a file review of 100 clients attending an outpatient clinic. About 48% had engaged in SH at the time of initial assessment, and 16% had expressed suicide ideation without SH. Children and adolescents who had engaged in SH and had suicidal ideation were older, had higher rates of maternal substance abuse, family histories of offending, and histories of sexual abuse. Previous episodes of SH were more common. In another study, Fortune (2006) explored the issue of cutting as a form of SH; young people who used cutting as a form of SH also used other forms of SH. Those who had used cutting as SH were not identified as a subgroup, and there was a crossover in the SH methods used by young people. Fortune suggested that cutting be viewed as an expression of distress, and that

clinical help should be adequately provided so the need to engage in further SH was ameliorated.

3.1.4 New Zealand Community Studies

The Adolescent Health Research Group (AHRG) in New Zealand carried out a comprehensive national survey of secondary school students in 2001, 2007, and 2012 (Clark et al., 2013). SH was reasonably common in the students who participated in the 2012 survey; 29% of female students and 18% of male students had deliberately harmed themselves in the previous 12 months. About one fifth (21%) of female students and 10% of male students had seriously thought about suicide over the last 12 months, and 6% of female and 2% of male students made a suicide attempt in the same period (Clark et al., 2013). Chan et al. (2018) further analysed this data; 7.9% reported repeated NSSI in the last 12 months. Low mood and exposure to suicide attempts in friends and family members were associated with suicide attempts and repeated NSSI.

This study aims to describe the rates of SH in children and youth below 15 years presenting to Southland Hospital in Invercargill with SH, the clinical characteristics of young patients with SH, methods used for SH, immediate stressors associated with the index SH, substance abuse, violence associated with SH, and the aftercare for patients with index SH.

3.2 Methods

This study was conducted at Southland Hospital, Invercargill, which is the southernmost hospital in New Zealand. It was a retrospective file audit of all the individuals aged nine years and above presenting to the hospital, emergency department (ED), or to the Southland Mental Health Emergency Team (SMHET) with SH between 1st January 2011 and 31st December 2012.From the entire data set of 293 SH attempts in the study period, a total of 34 young children and adolescents between the ages of 9 and 15 years were identified and analysed separately.

3.3 Results: Rates of SH in Children and Youth Below 15 Years in Invercargill, New Zealand

3.3.1 Demographics of Patients Engaging in SH

As shown in Table 1, a total of 34 children and adolescents below the age of 15 years presented to hospital with SH during the study period (1st January 2011 to 31st December 2012). The female to male ratio was 3.85:1. The youngest patient was nine years of age. Most were aged 14 and 15 years. About three quarters (73.5%) of the patients were recorded as European/Pakeha and one quarter Māori (26.8%). The majority (94%) lived with whānau (family).

Table 1
Patient Demographics by Gender

	Male (7)		Female (27)		Total (34)	
	N	%	N	%	N	%
Age of index SH (years)						
9–11	2	28.6	0	0	2	5.9
12–13	2	28.6	5	18.5	7	20.6
14–15	3	42.9	22	81.5	25	73.5
Ethnicity						
Pakeha	6	85.7	19	70.4	25	73.5
Māori	1	14.3	8	29.6	9	26.8
Living situation						
Whānau	6	85.7	26	96.3	32	94.1
Out of home placement	1	14.3	1	3 .7	2	5.9

3.3.2 Clinical Characteristics of Children and Adolescents with SH

A small minority of the children and adolescents who presented with SH, about 6%, were current clients of mental health services in Invercargill at the time of the index SH episode (Table 2). More than one third (38.2%) of the sample had a co-morbid psychiatric diagnosis, females more than males (9:4), and one fifth were receiving psychiatric medications either through mental health services or their GPs. Of the disorders, depression was most prevalent (23.5%). Others noted were conduct disorders/oppositional disorders (8.8%), eating disorders (8.8%), anxiety disorders (5.8%), and ADHD (2.9%).

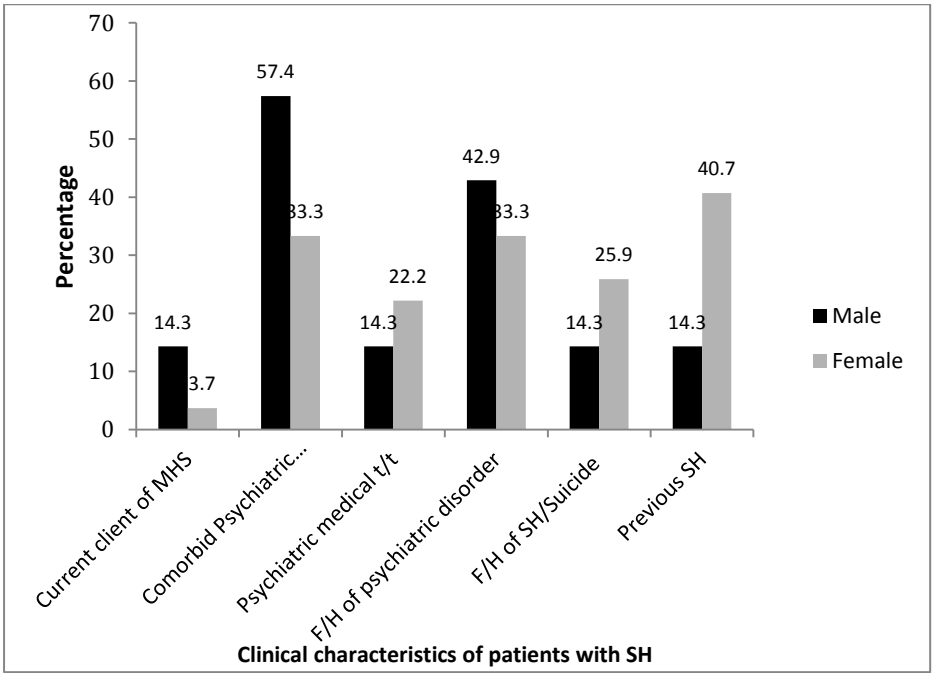
A positive family history of psychiatric disorders was present in about one third of cases (35.3%). A family history of suicide and SH was present in roughly one fifth of the sample (23.5%). One third of the patients (35.3%) had a previous history of SH. More females had previous SH (40.7%) compared with males (14.3%).

Table 2
Clinical Characteristics of Patients with SH

	Total (34)		Male (7)		Female (27)		
	N	%	N	%	N	%	p
Current client of MHS	2	5.9	1	14.3	1	3.7	0.37
Co-morbid psychiatric diagnosis	13	38.2	4	57.4	9	33.3	0.38
Psychiatric medical treatment	7	20.6	1	14.3	6	22.2	1
F/H of psychiatric disorders	12	35.3	3	42.9	9	33.3	0.67
F/H of SH/Suicide	8	23.5	1	14.3	7	25.9	1
Previous SH	12	35.3	1	14.3	11	40.7	0.37

P–Fisher's exact statistic value

Figure 1
Clinical Characteristics of Patients Presenting with SH



3.3.3 Methods of SH

Methods of SH are shown in Table 3. Overdose was the most common method, noted in more than half (55.9%) of the children and adolescents, with females (59.3%) outnumbering males (42.9%). The second most common means was cutting (35.3%), more commonly seen in females (40.7%) compared to males (14.3%). SH with higher

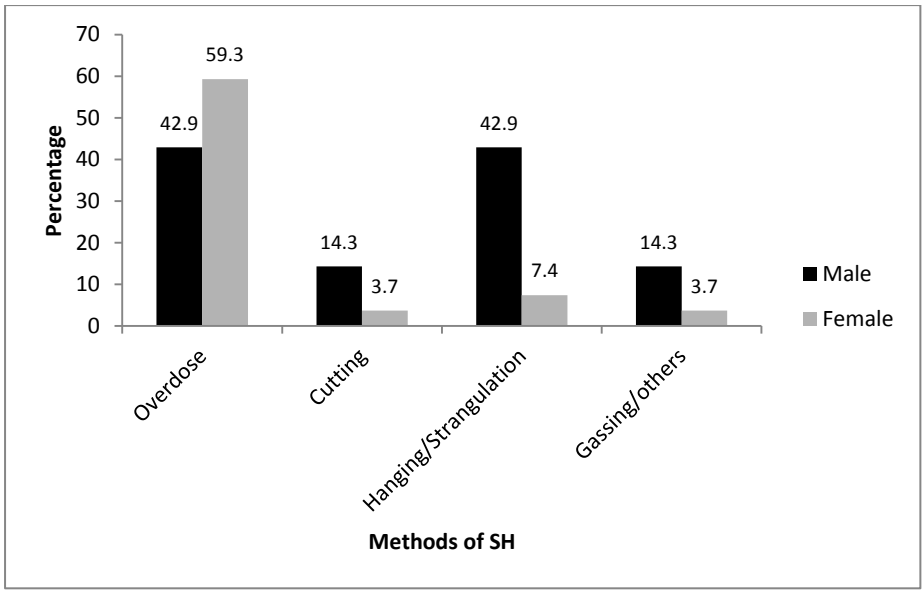
lethality in young people is of great concern; hanging and strangulation was reported in 14.7% of the total sample. Almost half (42%) of young males had used lethal forms for SH.

Table 3
Methods of SH

	Total (34)		Male (7)		Female (27)		
	N	%	N	%	N	%	p
Overdose	19	55.9	3	42.9	16	59.3	0.67
Cutting	12	35.3	1	14.3	11	40.7	0.37
Hanging/Strangulation	5	14.7	3	42.9	2	7.4	0.04*
Gassing/Other	2	5.9	1	14.3	1	3.7	0.37

P – Fisher's exact statistic value

Figure 2
Methods of SH



As shown in Table 4, the different methods of SH were categorised into three broad groups: overdosing, cutting, and others (including gassing, hanging, and strangulation). A previous history of SH was present in almost a similar proportion in those who had taken an overdose (42.1%), compared with those who had cut themselves (41.7%). A family history of SH and suicide was almost twice as prevalent in those who had overdosed (31.6%), whereas it was present in 16.7% of young people who had cut themselves as a form of SH.

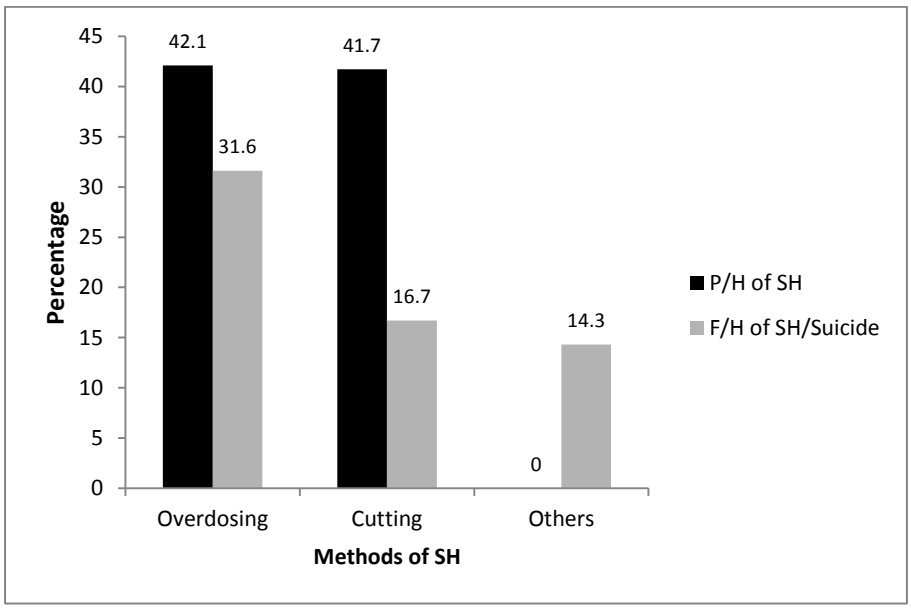
Table 4

Past History and Family History of SH and Suicide Across Different Methods of SH

		Overdosing		Cutting		Others	
		(N = 19)	%	(N = 12)	%	(N = 7)	%
Past history of SH	Yes	8	42.1	5	41.7	0	0
	No	11	57.9	7	58.3	7	100
Family history of SH/suicide	Yes	6	31.6	2	16.7	1	14.3
	No	13	68.4	10	83.3	6	85.7

Figure 3

Past History and Family History of SH and Suicide Across Different Methods of SH



3.3.4 Stressors Associated with Index SH

By far the most common type of stressor related to index SH (in Table 5) in young patients was arguments (with family, girlfriends, and boyfriends) (35.3%). This was followed by school-related problems/academic pressures (23.5%) and school bullying (14.7%). Relationship breakups leading to a SH attempt was seen in 14.8% of females. The recent breakup of parents was associated with the SH in 11.1% of young females. Only in a small number of patients, bereavement and recent medical diagnosis were noted to be the precipitating cause of the SH (5.9%).

Table 5

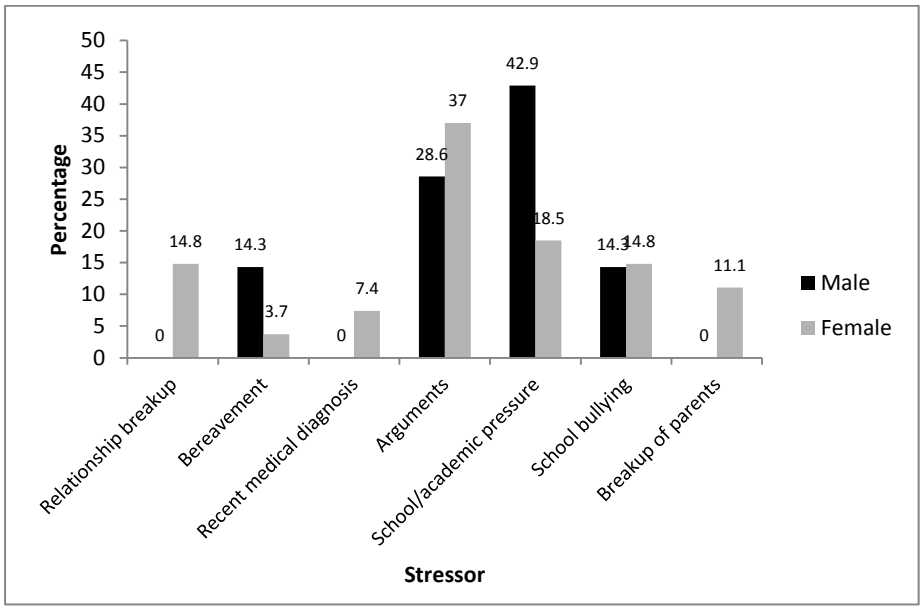
Stressors Associated with Index SH

	Total (34)		Male (7)		Female(27)		
	N	%	N	%	N	%	p
Relationship breakup	4	11.8	0	0	4	14.8	0.55
Bereavement	2	5.9	1	14.3	1	3.7	0.37
Recent medical diagnosis	2	5.9	0	0	2	7.4	1
Arguments	12	35.3	2	28.6	10	37	1
School/academic problems	8	23.5	3	42.9	5	14.8	0.31
School bullying	5	14.7	1	14.3	4	14.8	1
Breakup of parents	3	8.8	0	0	3	11.1	1

P–Fisher's exact statistic value

Figure 4

Stressors Associated with Index SH



3.3.5 Substance Abuse and Violence in Patients with SH

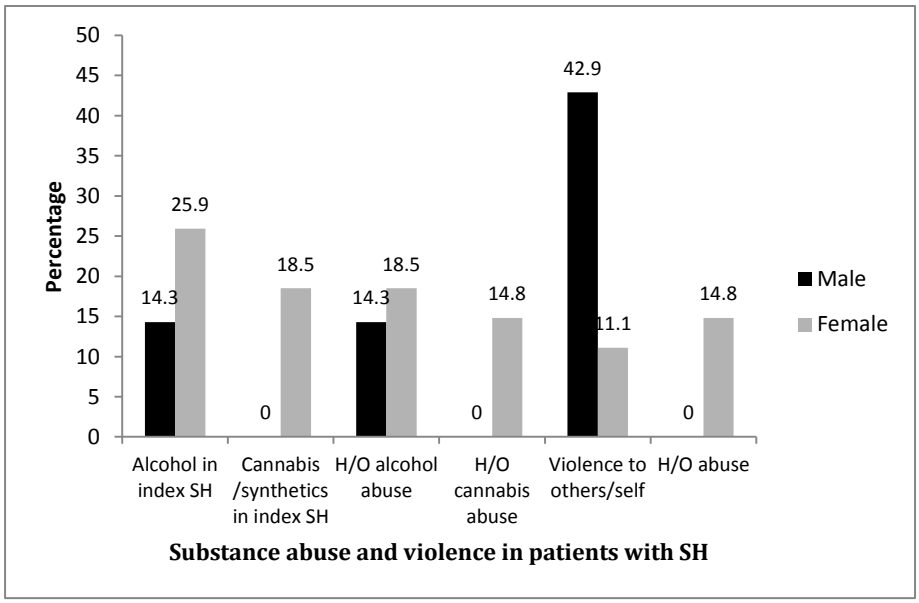
Alcohol had been consumed at the time of the index SH in about one fifth of the total sample (23.5%), as shown in Table 6. More females (25.9%) than males (14.3%) had used alcohol. Use of cannabis and synthetic cannabis at the time of the index episode of SH was seen in 18.5% of the females. A history of alcohol abuse was observed in 17.6% of the total sample, and a history of cannabis abuse was noted in 11.8% of the total sample. Violence to others and self was seen in 17.6% of the sample. A history of abuse (physical and sexual) was noted in the female population (14.8%). It is possible that this is an underestimate and there may have been inconsistent questioning about past abuse, especially with the boys.

Table 6
Substance Abuse and Violence in Patients with SH

	Both (34)		Male (7)		Female (27)		
	N	%	N	%	N	%	p
Alcohol in index SH	8	23.5	1	14.3	7	25.9	1
Cannabis or Synthetics in index SH	5	14.7	0	0	5	18.5	0.55
H/O Alcohol abuse	6	17.6	1	14.3	5	18.5	1
H/O Cannabis abuse	4	11.8	0	0	4	14.8	0.59
Violence to others/self	6	17.6	3	42.9	3	11.1	0.08
History of abuse	4	11.8	0	0	4	14.8	0.55

P – Fisher's exact statistic value. * Significant at < 0.05

Figure 5
Substance Abuse and Violence in Patients with SH



3.3.6 Aftercare of Patients with Index SH

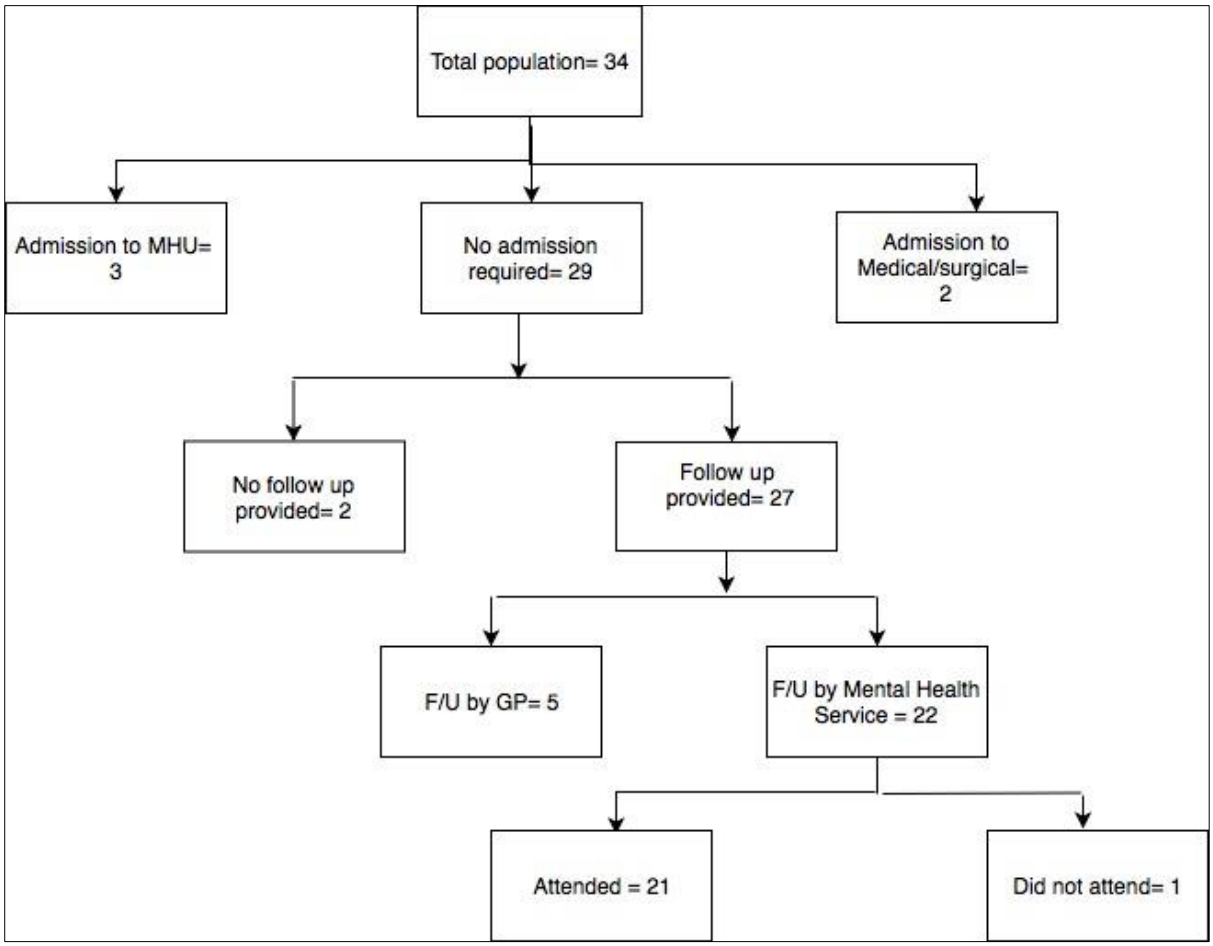
The children and adolescents seen by SMHET for any form of SH and those who required follow-up were monitored closely for up to three weeks by SMHET, and were also referred to the Child Adolescent and Family Services (CAFS) team. A case manager would be allocated for the young people, and they would then take over the responsibility to follow-up from SMHET. The CAFS psychiatrist would also see the young people within 3–4 weeks at the earliest.

The majority of SH attempts in children and adolescents who came to the hospital were followed up by Southland mental health services (21 SH episodes, 61.8%). Follow-up meant that they were followed up by SMHET for up to three weeks, and were by then

allocated a case manager through the CAFS team and received follow-up by a child and adolescent psychiatrist as well. One person did not attend.

A small number of SH attempts required admission to the medical/surgical ward (2 SH episodes, 5.9%) or the mental health inpatient unit (3 SH episodes, 8.8%). Five attempts (14.7%) were referred to their doctors (GP) in primary care for follow-up. This group of young people did not have any underlying psychopathology warranting follow-up by specialist mental health services. A letter with a detailed assessment was sent to their GP, and clients were requested to see their GP. Of the total SH episodes during the study period, two attempts (5.9%) were deemed not to require any follow-up. There were no admissions to the intensive care unit, and no deaths by suicide.

Figure 6
Aftercare Following Index SH



3.4 Discussion

This study was a part of a retrospective file audit of all patients presenting to the Southland Hospital with SH over two years. SH in children presenting to the hospital was relatively uncommon in this study. The youngest person in the study was nine years old. The majority of the children and adolescents were aged between 14 and 15 years (73.5%), compared to 12 to 14 years in a larger UK study, which collected cases over a 26-year period (Hawton and Harriss, 2008).

Females outnumbered males 4:1, as reported previously (Nadkarni et al., 2000; Geulayov et al., 2018; Hawton and Harriss, 2008; Martin Reith et al., 2003). This pattern of gender differences in young populations has been described in other studies, as well as ratios ranging from 6.5:1 (Hawton and Harriss, 2008) to 9:1 (Hawton et al., 1982).

The majority of the Southland population (89%) are European/Pakeha (versus 74% nationally), and 13% are Māori (versus 14.9% nationally). Given that Māori comprise almost one fourth of this SH cohort but make up only 13% of the population in Southland suggests an overrepresentation of Māori in this SH cohort.

In this study, current psychiatric co-morbidity was present in 38.2% of the sample, which is higher than the 7.7% seen in a study from Oxford, UK (Hawton and Harriss, 2008), and 25% in another study from Leicester, UK (Nadkarni et al., 2000). Olfson et al. (2005) noted psychiatric co-morbidity in over half of their sample. Family history of SH and/or suicide may be important in understanding aetiology of SH in children and adolescents. A positive family history of suicide was reported in 6.6% of cases presenting with SH in a study from Ireland (McNicholas et al., 2011). In our study, a positive family history of SH/suicide was higher, was noted in 31.6% in those who had overdosed, in 16.7% in those who had used cutting as a means of SH and 14.3% of those who had used other means of SH. Suicidal behaviour aggregates in families.

SH by overdose has been reported as being as high as 90% in two studies (Nadkarni 2000; Hawton and Harriss, 2008). Overdosing was the most common means of SH in this sample (55.9%). Cutting was the second most common means of SH in this sample (35.2%). Even when the individual cutting episode is deemed to be ‘minor’ and does not

require surgical intervention, it should be taken very seriously in young people, because frequent episodes of cutting among young men has been shown to have a poor prognosis, and cutting has been shown to be associated with young people who ultimately died by suicide (Fortune et al., 2007). SH in any form in young people highlights the need for supportive initiatives, as the risk of death has been shown to be four times greater than expected in young people following SH (Hawton and Harriss, 2007).

Hanging and strangulation were used as a method of SH in 14.7% of the sample, particularly more in males. Hanging is the most common form of suicide among youth in New Zealand (Beautrais, 2000b). It highlights the urgent need to understand possible preventive strategies for this method of SH.

Emotional neglect, psychological or physical abuse, and sexual abuse experienced in childhood are associated with SH in adolescence (Fleige et al., 2009). A history of childhood abuse (sexual and physical) was noted in 11.8% of the sample. Another study from New Zealand (Fortune et al., 2005) reported that among those presenting for outpatient psychiatric care, a history of childhood sexual abuse was found in upto 30% of children engaging in SH. These differences could be related to the fact that the data were collected from a retrospective file audit and hence if it was not asked and not reported, the data obtained did not reflect that actual frequency of abuse.

Only a few individuals presenting with SH were current clients of mental health services. This highlights that SH in children and adolescents may not always be associated with a major mental illness. It may also reflect difficulty accessing services, or viewing services as being the place to seek support or assistance only when problems become severe. A number of other factors could contribute to SH in young people; it may be related to adolescents' risky behaviour (Madge et al., 2011), parenting styles and parent-child conflict (Fergusson et al., 2007; Brent and Mann, 2005), a general feeling of unhappiness and poor sense of belonging in school (Kidger et al., 2015), increased stress for adolescents, greater use of alcohol and drugs, easier access to medication, and social transmission of SH behaviour (Hawton et al., 2012b).

Almost one third of the sample had prior SH, also reported in an earlier study from New Zealand (Fortune et al., 2005). A history of previous SH was reported in one quarter of

patients in a study from England (Hawton and Harriss, 2008) and in more than half (53.3%) of the patients in the Multicentre Study of Self-Harm in England (Hawton et al., 2012a). Repeat SH not only signifies persistent distress in the individual, but it also increases the risk of death by suicide (Tejedor et al., 1999). Numerous studies have shown that a history of SH significantly elevates suicide risk (Hawton and Fagg, 1988; Cooper et al., 2005; Hawton et al., 2003). Even when SH is not associated with a mental health diagnosis, clinicians should pay attention to prior SH, as it is a predictor of future suicidal behaviour (Beautrais, 2000a; Vajda and Steinbeck, 2000; Fortune, 2005).

Past history of SH was observed equally in those who had overdosed and/or used cutting as a means of SH. About one quarter of the sample had a positive family history of SH/suicide compared to 35.6% of patients in another study (Hawton et al., 2002a). In the current study, a family history of SH/suicide was more common in those who had overdosed compared to those who used cutting or other means of SH. A positive family history of suicidal behaviour in the absence of other associations has been shown to be less important for individuals who have already engaged in SH than in contributing to its initiation (Hawton et al., 2002a), and has been shown to be associated with SH in both genders (O'Connor et al., 2009).

Arguments or problems with family members are commonly cited precipitants for SH in young people. In line with this, the most common stressors associated with the index SH in this study were arguments with parents, girlfriends, or boyfriends. It may be an indication of poor coping abilities. It has been shown that SH in adolescents in many cases becomes a precursor of SH in young adulthood (Fergusson et al., 2005; Harrington et al., 2006). In this sample, arguments were reported in 35.3% of SH episodes, slightly over one third of the total attempts. Difficulties with family members just before SH has been recorded as high as high as 77% in children under the age of 15 years presenting to hospital (Hawton and Harriss 2008); relationship problems were the predominant difficulties associated with SH in children and adolescents in the Multicentre Study of Self-Harm in England (Hawton et al. 2012a). Arguments or disagreements with family members can also affect the immediate aftercare of SH, sometimes resulting in inpatient admissions, as the family remains reluctant to take children back home after an episode of SH.

School/academic problems as a perceived stressor for the index SH were noted in about one quarter of the sample (23.5%). SH in young people has been associated with school stress (Hawton et al. 2003; Hawton and Harriss, 2008) and academic underachievement (Kosky, 1983). School bullying was reported by 14.8% of the Southland sample leading up to SH. School-related stress represents an area for intervention to reduce SH in young children and adolescents. In a large descriptive study by Hawton et al. (2003), significant reductions in SH were noted during school holidays. Parents and teachers should also be vigilant for any visible signs of 'distress' in children at school.

The breakup of parents can be extremely stressful for children. It was identified as a precipitating factor in the index episode of SH in a small number (8.8%) in the sample. Marital disintegration among parents was also reported in another group of young patients admitted to hospital after a suicide attempt (Kosky, 1983).

Alcohol and illicit substances have been associated with SH in adolescents in earlier studies (Palmer and Martin 2016; Martin et al., 2010; Olfson et al., 2005; Mars et al., 2019). Recent alcohol abuse was seen in 17.6% of the present sample, and cannabis and synthetic cannabis was used in the index SH in 14.7% of patients. Though numbers are small, it is essential for clinicians to be aware that young people are using alcohol and illicit substances.

Compared to the small proportion (1.9%) of young patients presenting with SH to a UK general hospital being admitted (Hawton and Harriss, 2008), in this sample, 8.8% of SH episodes required mental health inpatient stay. Reasons for a higher proportion could include the severity of the attempt, the repetitive nature of SH, psychiatric co-morbidity, or unavailability of social supports like parents or family who could take the child home and manage with outpatient support from mental health services. This customarily involves working with client and family together. It was noted that approximately 60% of children and adolescents who presented with SH attended follow-ups with SMHET and/or CAFS. This proportion of young people who attended follow-up by the mental health services was much higher compared to the 50% of young people who attended four or fewer outpatient follow-up sessions in another study (Ougrin and Latif, 2011).

3.5 Limitations

As this was retrospective data collection, the emphasis was given to SH, which needed medical attention at the time of evaluation. Only the primary method of SH was utilised for analysis. There is a possibility that children may have used other methods of SH as well but may not have reported it. The small sample provides a snapshot of the extent of this issue in the community rather than providing a true reflection of the magnitude of SH; as we have seen, many SH episodes do not present to hospital. The suicidal intent was not noted in the mental health assessment forms used at the time of the initial assessment after SH. It would have been useful to look at suicide intent in children and adolescents at the time of SH as it has been shown that lethality of SH is strongly associated with high suicidal intent (Haw et al., 2003).

3.6 Conclusion

Though the total number of youth presenting with SH in this study was small, it has highlighted that SH can occur in children as young as nine years of age. Medication overdose was the most common form of SH. Children and adolescents who presented with SH frequently had life problems such as relationship breakups, arguments with family/friends, and school-related difficulties. A family history of SH and suicide was present in almost one fourth of the cohort and was noted to be more prevalent in those who overdosed as compared to those who used cutting or other forms of SH. Family involvement in the assessment and treatment planning of a young person presenting with SH is always critical. Youth substance abuse remains an ongoing problem that also needs to be addressed in the ED. Preventive initiatives in schools and communities should be implemented so young people do not fear asking for help and can develop better coping strategies. There should be a comprehensive effort to educate public and primary health care workers about depression in children and adolescents, as depression remains a risk factor for SH and can be treated. The internet and other technologies can also be used to provide young people with reliable information and help, especially when they are distressed. An effort should be made to decrease stigma so that young people seek advice and engage with health services. It is equally important for vulnerable young people to have a smooth transition from child and adolescent mental health services to adult services.

By improving the knowledge about SH and increasing awareness about the mental health and the well-being of young people, we can hope to identify 'at-risk youth' so SH in young people can be reduced. This may help us to achieve a reduction in youth suicide rates in New Zealand.

3.7 Future Implications

The findings of this study support the view that co-morbid psychiatric conditions are an important risk factor of SH behaviour in young people. Active detection and management of mental health conditions in young people should be a priority. Improved services and access to specialist mental health services could be relevant for reducing SH behaviour in children and young adolescents. Appropriate counselling available at school would help young people learn better coping strategies and improve their resilience. We should also develop interventions for SH in the ED setting. A large study (Aotearoa Self-Harm Hospital Study) will build on this smaller study and help understand the epidemiology and service needs of young people presenting to hospital.

Chapter 4: Study 3: Self-Harm in 15-Year-Olds – 5-year National Trends in New Zealand

4.1 Introduction

SH is important clinically because of its association with mental health and the increased risk of subsequent suicide. Studies have shown that less than a quarter of children and adolescents who SH present to health care services (Arensman et al., 2018; Ystgaard et al., 2009). National surveys have reported that rates of SH are highest in late adolescence/early adulthood, with declining rates in older adults (Skegg, 2005; Schmidtke et al., 1996; Hatcher et al., 2009). However, there have been relatively few studies on SH in late childhood and early adolescence. Monitoring SH in children and young adolescents is crucial as it can provide an understanding of the changing demands on mental health services and the preventive strategies needed.

In New Zealand, Hatcher et al. (2009) have described the characteristics of people presenting with intentional SH to four district health boards. The largest numbers of female presentations were in the 15–19 year age group (276, 25.6% of female subjects); it was comparatively less in the 20–24 year age group (159, 14.7%) and 30–34 year age group (131, 12.1% of total). The largest numbers of male presentations were in the same age brackets: 15–19 year age group (105, 19% of male subjects), 20–24 year age group (80, 14.4%), and 30–34 year age group (70, 12.6%).

The Irish National Registry of SH collected data on SH presentation to hospital EDs between 2003 and 2009. There was a successive 10% increase in the male rate of SH in 2008 and 2009; the peak rates in women were in the 15–19 year age group (620 per 100,000 (95% CI: 605-636), and in men in the 20–24 age group (427 per 100,000 (95% CI: 416–43) (Perry et al., 2012). McNicholas et al. (2019) examined trends of SH among young people aged 10–14 years in Ireland over a 10-year period. They noted that the rates of SH in all age groups (10–24 years old) increased by 22%, with the largest increase in young people aged 10–14 (+82%). The methods of SH were also associated with higher lethality, emphasising the need for interventions to reduce risk of repeat SH and suicide among this population.

Similar upward trends have also been noted in Australia for young people being hospitalised for SH (Australian Institute of Health and Welfare, 2014); young females aged 15–19 years account for a significant proportion of those hospitalised with SH (Australian Institute of Health and Welfare, 2014).

To study SH in younger people presenting to hospitals in New Zealand, this section looks at 5 year national trends in SH in children and adolescents 15 years and younger between 2008 and 2012.

4.2 Method

Ethics approval was sought and was granted by the University of Otago Ethics Committee (H13/033).

The data set was requested from the New Zealand Ministry of Health's National Minimum Data Set (NMDS) (NZ National Minimum Data Set) for all the visits to emergency departments and hospital admission that were coded for SH (International Classification of Diseases; ICD 10 codes X60-X80) for patients 15 years and younger between the years 2008 and 2012. NMDS has centralised records of individual patients' contact with hospitals and emergency departments since 2008. This data set included age; gender; ethnicity; method of SH; and outcome of the assessment for SH, including the duration of hospital stay and mental/behavioural disorder diagnosis (ICD 10 F codes).

After obtaining this data set, each individual was assigned a unique identifier code to help identify repeated entries in the data set. Deprivation scores were also collected using the New Zealand Index of Deprivation (NZDep), a small-area measure of deprivation derived from individual census data. NZDep is based on eight variables (income, home ownership, employment, qualifications, family structure, housing, access to transport, and communications).

NZDep is represented as proportions, and is constructed as a weighted sum of these proportions determined by a principal component analysis of variable importance (Salmond and Crampton, 2012). The data was then analysed using summary statistics, Pearson Chi-square, and regression methods. The 2013 NZ Census (Statistics NZ: Estimated resident population) was used to calculate the age-specific SH rates. An

exploratory generalised linear model (GLM) was developed to examine the influence of covariates on repetition of SH within a 12-month period from the initial SH assessment, using data from 2009–2013. All individuals presenting with SH from 2008 were excluded from the analysis to remove potential bias for individuals who might have been seen before this time and which might affect getting a mental health disorder diagnosis. The data from 2013 was used to confirm a repeat SH from individuals observed between 2009 and 2012. Since 66% of individuals with repeated SH occurred within 1 year (data not shown), this removed a significant proportion of previously seen individuals. An initial GLM was run using the covariates of deprivation, age, NZ deprivation index, gender, ethnicity, and mental health diagnosis at first hospital presentation. Significant variables were determined using stepwise Akaike information criterion (AIC) (Akaike, 1974).

4.3 Results

4.3.1 Total Number of Cases of SH

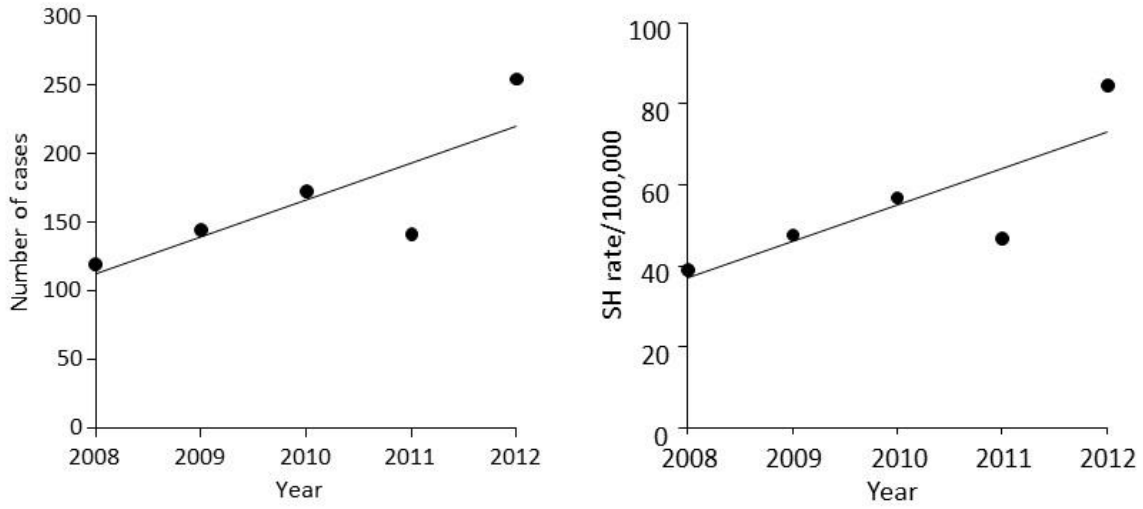
There were a total of 27,050 cases of SH in children younger than 15 years in New Zealand, reported between the year 2008 and 2012. Of these SH cases, 3.1% (830 reports) were among 743 patients who were 15 years or younger. As shown in Figure 1A, the yearly number of cases reported increased 113% over 5 years (range 119-254; r^2=0.64; left panel). The rate of SH/100,000 youth aged 10-<15 years increased 115% over this period (range 39.2-84.7; r^2=0.64; right panel).

Figure 1A

Number of cases of SH (left panel) and rates of SH (right panel) in individuals aged 10-<15 years by year.

Figure 1A

Number of cases of SH (left panel) and rates of SH (right panel) in individuals aged 10-<15 years by year.

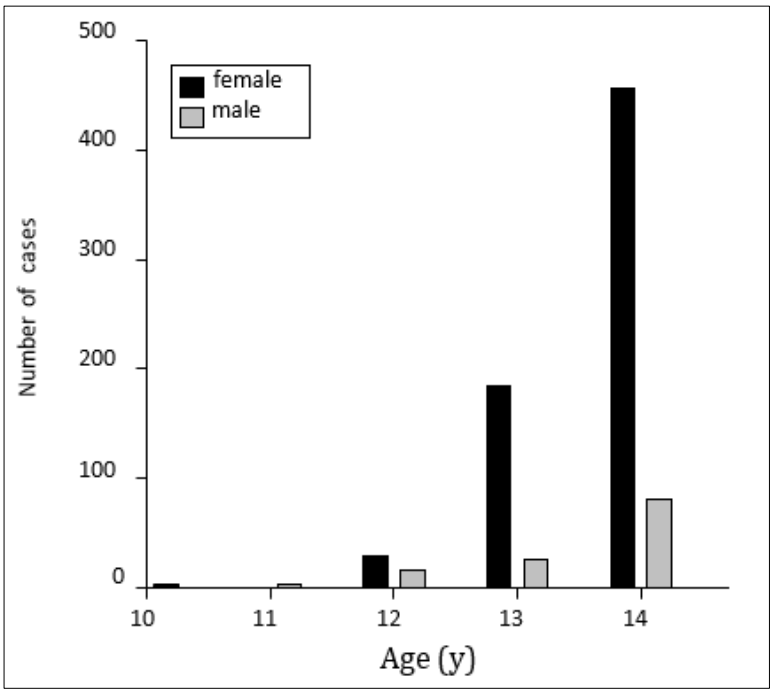


4.3.2 Demographics: Age and Gender of Individuals Presenting with SH

As shown in Figure 1B, SH cases before the age of 11 years were rare, but it was noted that the number of cases became more frequent with increasing age in both males and females. SH cases were more frequently seen in females than in males, with an overall ratio of close to 4:1 (683:147).

Figure 1B

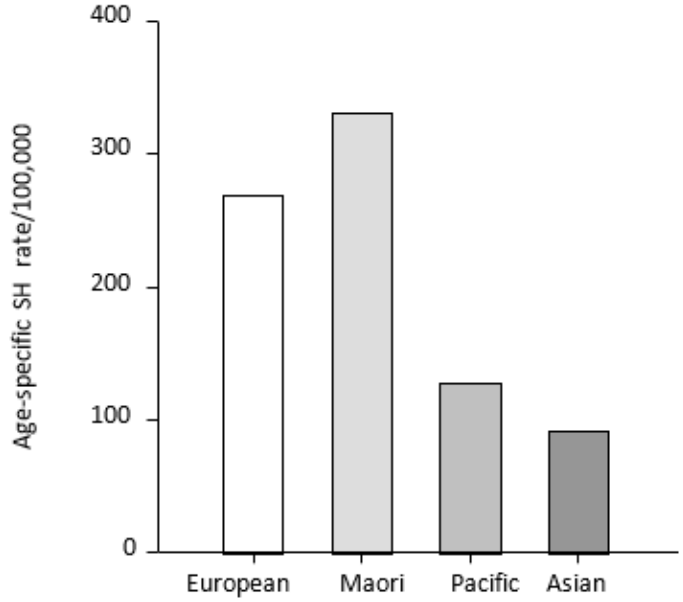
Age at SH Episode, by Gender



4.3.3 Demographics: Ethnicity and SH

The majority of patients were of European/Pakeha ethnicity (63%), with 26% Māori, 5% Pacific, 4% Asian ethnicities, and 2% other ethnicities. Age-specific SH rates were highest for Māori and lowest for young people of Pacific and Asian ethnicities (Figure 1C).

Figure 1C
Age-Specific SH Rates/100,000 by Ethnic Group

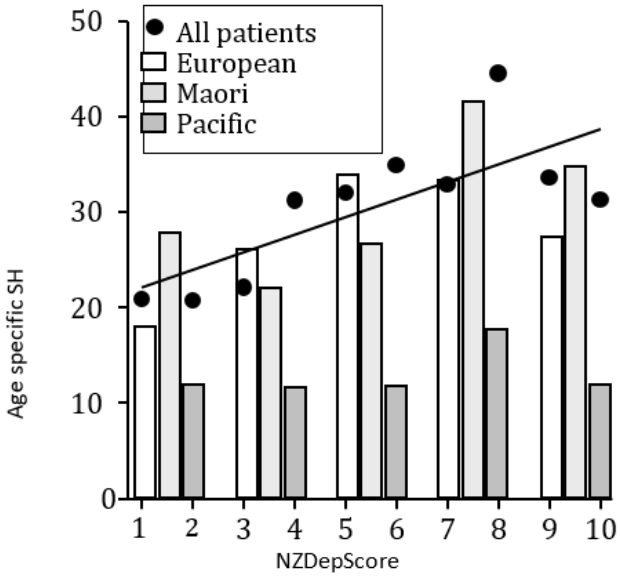


4.3.4 SH, Deprivation Scores, and Age-Specific Rates

The majority of SH attempts (83%) involved self-poisoning, primarily from overdosing. SH involving hanging or strangulation was reported more commonly in Māori (18/172) than in all other ethnic groups (15/502; $Chi^2 = 12.1$, $df = 1$, $p < 0.001$). There was a strong correlation between higher deprivation scores and higher age-specific rates of SH ($r^2 = 0.64$; Figure 1D). The relationship between age-specific SH rates and deprivation was observed for European/Pakeha and Māori patients, but not for Pacific patients (Figure 1D). The bar graph in Figure 1D represents age-specific SH rates by ethnic group by NZDep quintiles.

Figure 1D

Relationship Between Age-Specific SH Rates/100,000, Ethnicity, and Deprivation Index (NZDep: 10 = most deprived)



4.3.5 SH and Mental Health Diagnosis

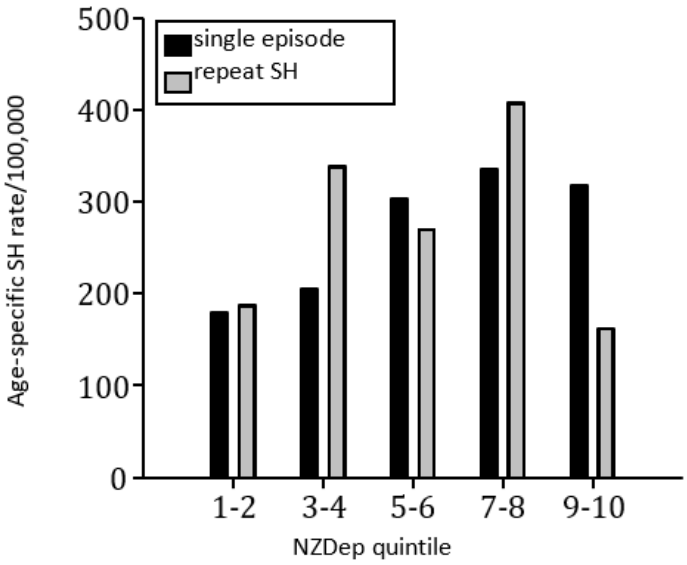
A mental health disorder diagnosis was present in 140 patients, comprising 174 episodes of SH. The most common diagnoses were mood disorders (n = 87, 62.1%), anxiety disorders (n = 12, 8.6%), adjustment disorders (n = 15, 10.7%), conduct disorders (n = 11, 7.9%), and alcohol-related disorders (n = 15, 10.7%). After evaluation, 62% of all episodes were admitted to hospital. Almost all admissions were brief, with only 67 (8% of all episodes) patients staying in hospital for more than 3 days.

4.3.6 SH in Single and Multiple Attempts

69/743 (9.3%) of patients had repeated (two or more) episodes of SH over 5 years. Of these 69 individuals with repeat SH episodes, there were 54 (47 females, 6 males) with two episodes, 12 (9 females, 3 males) with three episodes, and three (2 females, 1 male) with four episodes of SH. Age distributions for individuals with single and repeat SH were similar. There was a strong correlation between higher deprivation scores and higher age-specific rates of SH for individuals with a single episode of SH ($r^2 = 0.82$), but not for those with $\geq$2 episodes ($r^2 = 0.001$; Figure 1E).

Figure 1E

Relationship Between Age-Specific SH Rates/100,000 and Deprivation Index Quintile (NZDep: 10 = most deprived) for Individuals with Single versus Repeated SH Episodes

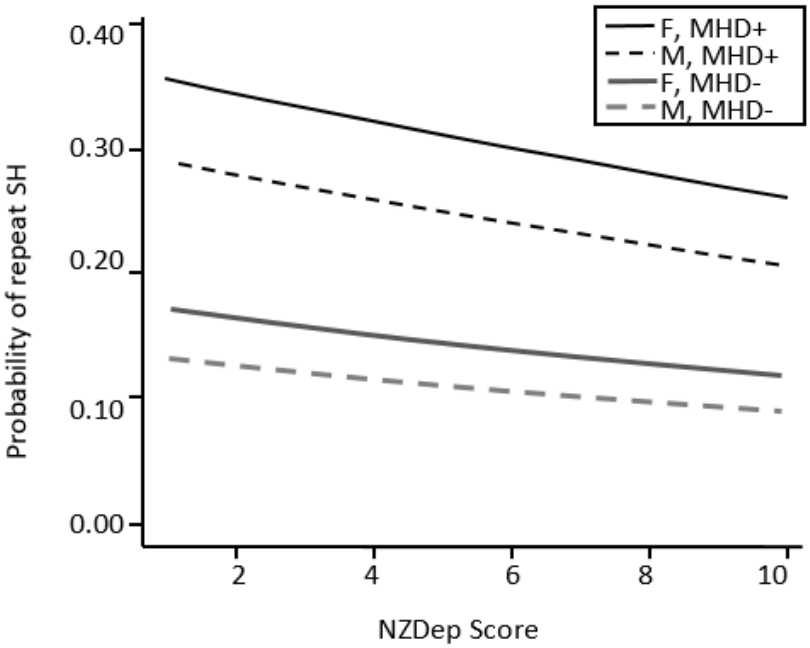


4.3.7 Generalised Linear Model and Probability for Repeat SH

Individuals with repeated SH were more likely to have mental health disorder diagnoses (32/140) than those with single SH episodes (37/603; $Chi^2 = 27.1$, df = 1, $p < 0.001$). The exploratory generalised linear model (GLM) of SH repetition within 12 months of an index episode showed a significant effect of mental health disorder diagnosis ($z = 3.83$, $p = 0.0001$), but not deprivation index ($z = -1.27$, $p = 0.21$) or gender ($z = -1.00$, $p = 0.31$). This is also shown in Figure 1F, a plot of probability for repeat SH by NZDep score, presence or absence of a mental health disorder diagnosis (MHD+/-), and gender. Forward stepwise regression indicated that the model accounted for everything, and that there was no residual variability (adjusted R2 of 1.00, $F=999.9$, $p<0.001$). To confirm this association, albeit at the cost of some statistical power, individuals observed from 2008–2010 were excluded from the analysis, with only those individuals considered who had repeated SH attempts from 2011–2013. This ensured that over 90% of repeat individuals had not been previously seen. The same association between repeat SH and mental health disorder diagnosis on the first presentation to hospital was observed (data not shown.

Figure 1F

Generalised Linear Model of the Probability for Repeat SH by NZDep Score, Presence or Absence of a Mental Health Disorder (MHD +/-), and Gender



4.4 Discussion

This is the first report of multi-year national SH trends in children and young adolescents 15 years and younger in New Zealand. Earlier descriptions of SH in this age group have been based on case series from UK hospitals (Hawton and Harriss, 2008; Ayton et al., 2003; Nadkarni et al., 2000; Kerfoot, 1988; Taylor and Stansfeld, 1984). Our findings are generally consistent with these earlier reports: cases of SH in the 15 years and younger age group make up only a small proportion (~3%) of all SH cases; cases are rare before age 11, with numbers then increasing exponentially; there is a female predominance; and overdosing is the most common method of SH in youth presenting to hospital. Repeated episodes of SH occurred in 9% of individuals, who appear to have higher rates of mental health disorder diagnoses than those with single SH attempts.

Two findings are potentially ominous. We observed yearly increases in the numbers of cases of SH, with an overall 113% increase in reported cases over 5 years, with case numbers in 2013 (396) continuing this trend. This is considerably greater than that reported in Oxford, UK (66% over 26 years (Hawton and Harriss, 2008). Although this increase could reflect administrative changes (e.g., in diagnostic coding), proportionally

this 5-year increase is much greater than that seen in 15–24 year olds (+57%) or adults >25 years (+17%) over the same duration in New Zealand (unpublished data). The second finding was that hanging/strangulation as a means of SH was three times more common in Māori than non-Māori. This is of particular concern given its potentially greater lethality. Māori are overrepresented in youth suicide in New Zealand (Suicide Facts, MOH, 2016), and hanging/strangulation is the most frequent method.

Although SH is a behaviour and not a diagnosis, it is associated with mental illness. We identified that a minority of individuals presenting with SH (140/743; 19%) had mental health disorder diagnoses. Earlier reports from Oxford identified similar proportions (up to 15.7%) of patients receiving or having received psychiatric treatment at the time of their assessment for SH (Hawton and Harriss 2008; Hawton et al., 1996). In these reports, psychosocial issues were identified as the most common reported problems, in particular relationship difficulties with parents or friends, or problems with school work. However, it should be noted that recordings of the mental health diagnosis is variable in ED settings.

Our finding of an association between age-specific SH rates and higher deprivation scores is consistent with an earlier report on youth SH (Ayton et al., 2003), and has been noted for older adolescents and young adults (Skegg, 2005). This analysis suggests that the association of SH with deprivation may be influenced by ethnicity. Māori and Pacific populations experience disproportionate levels of social deprivation when compared with people of European/Pakeha ethnicity (Salmond and Crampton, 2012), yet overall rates of SH leading to hospital service contact are almost two thirds lower for Pacific young people compared with Māori (Figure 1C). Furthermore, there is a positive association between NZDep score and SH rates for European and Māori, but not for Pacific young people (Figure 1D). We also did not observe higher rates of deprivation in youth with repeated SH, most notably in those with mental health disorder diagnoses (Figures 1E, 1F). This may suggest a possible subgrouping of youth SH: a larger socially deprived group with single episodes of SH and low rates of mental health disorder diagnoses, and a smaller group with a higher proportion of repeated SH and mental health disorder diagnoses.

4.5. Limitations

The shortcomings of this analysis should be acknowledged. Data were obtained from a national data set, rather than from patient interviews, and are likely to underestimate actual numbers of cases. A 12-month New Zealand survey identified 20% more cases of SH cases than were reported in national records (Hatcher et al., 2009). The SH numbers reported here underestimate the actual frequency in this age group. Many SH episodes do not come to medical attention. Community SH rates may be up to 16-fold higher than hospital presentation rates for SH (McMohan et al., 2014). Recent community and national surveys report youth SH rates between 13% and 20% (Lucassen et al., 2011; Kidger et al., 2012; Hawton et al., 2002 b; Landstedt et al., 2011). In community surveys, cutting is the most common SH method (Kidger et al., 2012), whereas overdosing is the commonest SH method for patients presenting to hospital, presumably reflecting greater concern about potential harm associated with this method. The finding of an association between having a mental health disorder diagnosis and higher probability of repeat SH within 12 months of an initial episode (Figure 1F) is based on an exploratory analysis. The data set is unable to distinguish between repeat SH being due to a mental health disorder, or that likelihood of diagnosis is greater in patients who are assessed more than once for SH. However, in a sensitivity analysis that removed over 90% of previously observed individuals, the observed association remained.

4.6. Conclusion

SH in children and youth form only a small proportion of the total SH in society but rates have been increasing. Recent US and NZ surveys in secondary school students identified lower rates of suicidal ideation/SH in students with higher levels of connectedness to family and school (Carter et al., 2007; Kaminski et al., 2010). Poor school experiences are associated with increased rates of SH (Kidger et al., 2015). Greater school, family, and cultural connectedness may have a protective effect for SH, because of increased ratings of well-being, and lower ratings of low mood and suicidality (Stuart and Jose, 2014; Raja et al., 1992). Management of youth SH may be addressed by local (O'Connor and Jose, 2012) or national (Ministry of Health, 2019) interventions that improve problem solving, and help boost connectedness with culture, family, and school (e.g., participation in community-based cultural or sporting activities). As there is an over representation of

Māori in youth suicide in New Zealand (Suicide Facts: Ministry of Health, 2016) and more lethal means of SH commonly used in the Māori population compared to the non-Māori population, we need to support leadership and resourcing of Te Aha Māori prevention strategies.

Chapter 5: Study 4: Clustering of Self-Harm in Invercargill, New Zealand

5.1 Introduction

A suicide cluster is defined as a "group of suicides or suicide attempts, or both, that occur closer together in time and place than would normally be expected on the basis of either statistical prediction or community expectation" (O'Carroll et al., 1988, p. 1). Suicide clusters, though uncommon, cause great concern. A suicide cluster usually includes three or more deaths; although even two suicides occurring in young people in a short period of time in a specific community (e.g., a school, university, or inpatient psychiatric unit) should be taken seriously, especially if these deaths occur in the context of increased SH (Hawton et al., 2019). Most research on clusters has focused on deaths by suicide rather than non-fatal SH. For example, Gould et al. (1994) studied clusters of suicide attempts in an early national study in New Zealand and showed evidence of clustering in people younger than 34 years and those aged between 55 and 64 years. SH is a key factor associated with suicide in young people (Hawton et al., 2012). Clusters can therefore include both suicide and SH (Too et al., 2017). Linked episodes of SH have been shown to be a precursor to a suicide cluster (Hacker et al., 2008).

Too et al. (2017) used 11 years of data from Western Australia between 2000 and 2011. They defined suicide attempts as admission to hospital for SH, and suicide as deaths due to SH. They noted that 1% (350 of 34,028) of suicide attempts were in seven identified spatial temporal clusters, and 0.6% (12 of 2,165) of suicides were in two spatial temporal clusters. Living in areas of low socio-economic status was linked to higher odds of suicide attempts being in a cluster. The odds of being in a suicide attempt cluster also increased as the proportion of indigenous people increased.

Different studies have identified different factors associated with clustering. Tondo et al. (2006) and Bridge et al. (2012) have suggested that clustering is related to poor access to mental health services. Other related factors may include higher unemployment (Beautrais et al., 1998; Blakely et al., 2003), or other aspects of social and environmental circumstances such as high levels of single person households, low levels of marriage,

and high unemployment (Gunnell et al., 2012). The association between unemployment and suicidal behaviour is non-causal and reflects common or correlated factors that contribute to the risk of both unemployment and suicidal behaviour. Any remaining association between unemployment and suicide attempt risk appears to arise from the correlation that exists between unemployment and psychiatric disorder (Beautrais et al., 1998).

5.1.1 Types of Clusters

Clusters can be of the following types:

1. Mass clusters – these are media related phenomenon where suicides or suicide attempts occur within a restricted period of time usually following the broadcasting or publishing of actual or fictional suicides, usually of high profile deaths, for example, Robin Williams (Haw et al., 2013; Hawton et al., 2019).

2. Point clusters – it is when an unusually high number of suicides occur in a small geographical area or in an institution over a relatively small period of time (Joiner 1999). These are also known as space-time clusters.

3. Geographical clusters – this is clustering of of suicides that happen in a specific location; they are not temporal. For example, suicides on the London Underground system or at Lawyers Head in Dunedin, New Zealand.

4. Method based clustering- (Hawton et al., 2019) is a form of clustering, which might occur with a mass or a point cluster where cluster of method of suicide exists (i.e., a specific type of overdose or injury).

5. Echo clusters – is a cluster of suicide, which occurs in the same location as a previous cluster, but some time later (Hawton et al., 2019).

5.1.2 Difference Between Contagion and Cluster

Contagion and clustering are frequently and sometimes incorrectly substituted terms. The word ‘contagion’ derives from Latin *contagio* (n), which is a combination of con – “together with” and the base of tangere “to touch”, and was originally used with regard to contagious diseases (Oxford English Dictionary and Merriam-Webster Dictionary).

In suicide research, contagion had been used interchangeably with clustering. However, Cheng et al. (2014) in their review paper argued the two terms are not interchangeable. These authors proposed that clustering occurs when there is higher than expected incidence of suicide within a defined group, geographical location, or institution, whereas contagion refers to the mechanism (e.g., imitation) which leads to an increase in suicide. Contagion is one explanation for suicide clustering. However, similarity of community and other features such as bullying may also be important risk factors.

A recent New Zealand study of secondary school students (Chan et al., 2018) examined the association between self-reported suicide attempts, NSSI (non-suicidal self-injury), and exposure to suicidal behaviour among friends, family members, and within school communities. They concluded that students who had been exposed to a suicide attempt of a family member were more likely to attempt suicide compared to those not exposed. The likelihood of attempts increased if the outcome was fatal. Exposure to suicide attempts also increased the possibility of repeated suicide attempts. Clustering of suicide attempts in the school community was not observed and accounted for only a small amount of the variance once other risk factors were accounted for.

Various studies have shown that young people more than adults appear to be more vulnerable to suicide clusters, with an estimated 1–5% of teenage suicide in America thought to be part of a cluster (Gould, 1990; Gould et al., 1990; Gould et al., 1987). Robinson et al. (2016) identified 12 spatial suicide clusters between 2010 and 2012 from the National Coronial Information System in Australia. Suicides by young people were more likely to occur as a part of a cluster, compared to adults. It was also noted that suicides by people with an indigenous background were more likely to occur in a cluster than suicide by non-indigenous people among both young and adults.

Fontanella et al. (2018) examined the spatial and spatiotemporal clustering of suicidal mortality and area level factors associated with high-risk suicide clusters in Ohio, US between 2004 and 2013. There were significant high-risk spatial clusters that spanned the urban-rural continuum, suggesting that there were multiple area level risk factors that influenced suicide rates beyond the urban-rural population density difference. Socio-economic deprivation was noted to be a relevant area correlate of living in a high-risk suicide cluster.

Studies on echo clusters are scarce. A nationwide study in New Zealand on suicide clusters (Larkin and Beautrais, 2012) detected ten echo clusters in nine locations separated by almost 7 years, although the demographic details of the individuals were not described.

Most of the research on SH clustering has focused on death by suicides (Gould, 1990; Gould et al., 1990; Gould et al., 1987; Robinson et al., 2016; Fontanella et al., 2018). There are few studies on clustering of suicide attempts like that of Gould et al. (1994). Too et al. (2017) have compared clustered suicide attempts to non-clustered attempts, and Chan et al. (2018) have examined the association between an exposure to SH and self-report of SH. Only suicide attempts requiring hospital admission were included in the studies in Gould et al. (1994) and a recent study from Australia (Too et al., 2017). All SH may not require hospital admission. Some SH in susceptible individuals may lead to their socialising with at-risk individuals and a diffusion of ideas and attitudes which in turn may lead to clustering of SH (Hawton et al., 2019). Interventions for clusters decrease the likelihood of spread of SH. This study aimed to see if there was clustering of SH in people presenting to Invercargill hospital over a period of 2 years, regardless of their admission to the hospital.

5.2 Clustering of SH in Invercargill, New Zealand

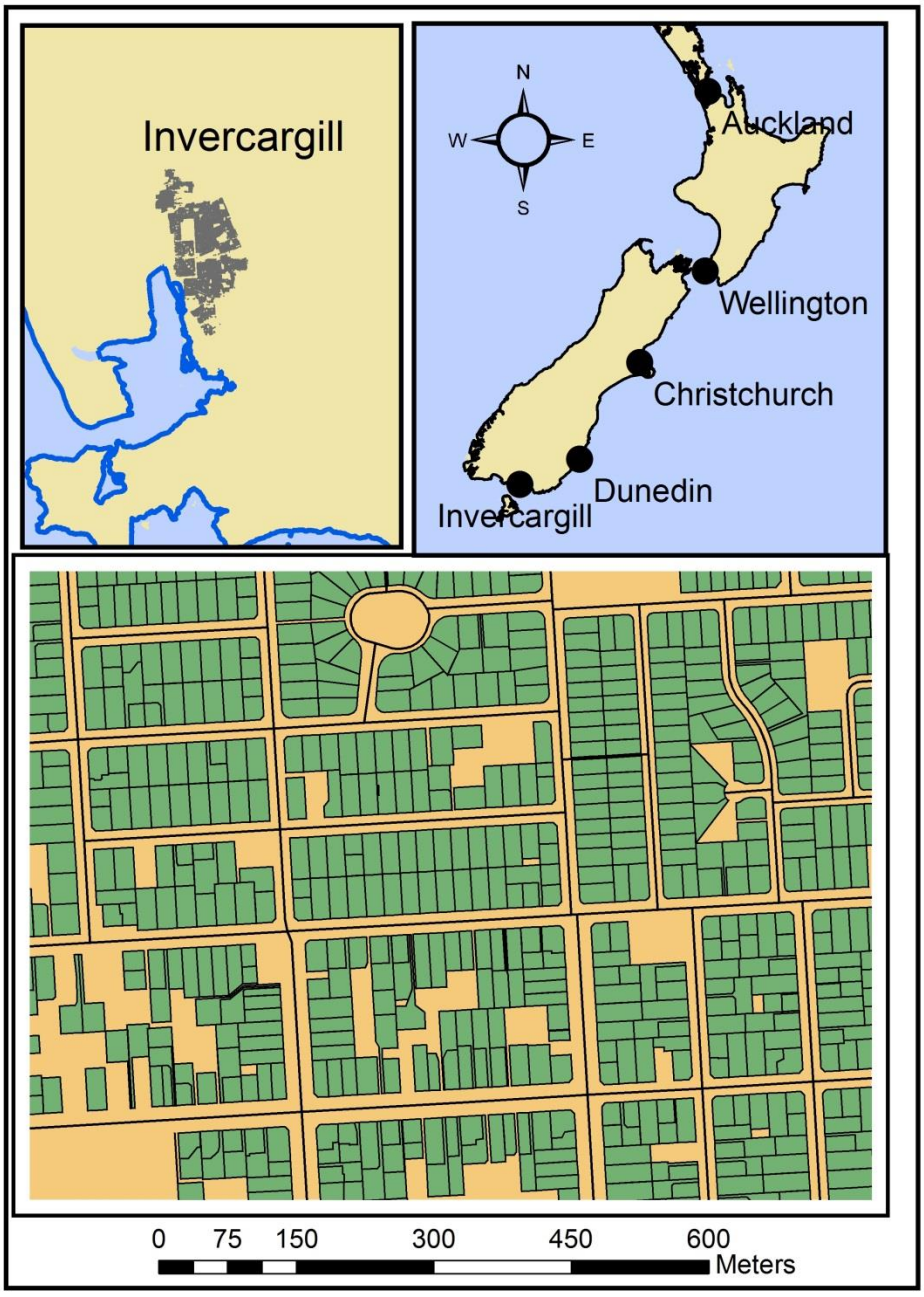
5.2.1 Methods

This study was a retrospective two-year audit based on a file review of all individuals who presented with SH to the emergency department (ED) or the Southland Mental Health Team (SMHET) at Southland Hospital, Invercargill, New Zealand between 1st January 2011 and 31st December 2012. The University of Otago Ethics Committee (H13/033) approved this study. Data were collected including demographic and clinical details, and residential addresses. Invercargill is a small urban centre in the South Island of New Zealand with a population of 51,696 (2013 census, Statistics New Zealand, 2013). Land parcels for Invercargill were obtained from the Land Information New Zealand online database (New Zealand Primary Parcels, LINZ, 2011).

The residential parcels were selected by selecting parcels where parcel_int = “DCDB” or “Fee Simple Title” AND statutory = NULL and survey_area > 0. The parcels were then

assessed by area, with the smallest 5% and largest 5% of parcels removed. By doing this, schools, recreational areas and other parcels that were filling spaces but were not accessible as polygons for residences were excluded. Using Google Maps to visually assess and remove parcels that were shops or industrial areas further reduced the study area. By doing this, a total of 16,516 residential parcels were generated that could be used as possible residential addresses. Efforts were made to reduce the number of residential parcels to reduce the likelihood of false clustering due to an oversized study area. Figure 1 shows the location of Invercargill (upper panels) and a section of the final residential parcels used in this study (lower panel).

Figure 1
The Urban Area of Invercargill, New Zealand



Note: Lower panel shows a portion of the residential land parcels (green) that represent the possible location of SH cases. A simulated SH episode can occur at the centroid of any residential parcel. Data obtained with permission from Land Information New Zealand (https://data.linz.govt.nz/).

The initial individual SH episodes (n = 291 episodes for 245 unique individuals) were reduced to those that intersected the residential parcels (n = 164 with 134 unique individuals; data that were not included were for individuals who lived outside of the

urban boundaries). Only the index episodes for a given location were kept. Individuals with repeat SH at the same address were removed; however the same individual who repeated SH at different addresses, or a different individual at the same address, was kept in the data set. The final SH data consisted of 136 index episodes, with two repeat individuals. A measure of socio-economic quality of life, the New Zealand Index of Deprivation (NZDep), was obtained based on the New Zealand Census data of 2006. NZDep is based on proportional measures of nine variables and constructed as a weighted sum determined by a principal component analysis of variable importance (Salmond and Crampton, 2012). Deprivation index is a small area measure ranging from 1 (high quality) to 10 (poorest). A value of 10 indicates that the mesh block is in the most deprived 10 percent of areas in New Zealand, according to the NZDep 2006 scores. These scores apply to areas rather than individual persons (Salmond et al., 2007).

Table 1

NZDep 2006 Combines the Following Census Data (Calculated as Proportion) for Each Small Area:

Dimension of Deprivation	Variable Descriptor (in order of decreasing weight)
Income	People aged 18–64 receiving a means tested benefit
Income	People living in equivalised* households with income below an income threshold
Owned home	People not living in own home
Support	People aged <65 living in a single parent family
Employment	People aged 18–64 unemployed
Qualifications	People aged 18–64 without any qualifications
Living space	People living in equivalised* households below a bedroom occupancy threshold
Communication	People with no access to a telephone
Transport	People with no access to a car

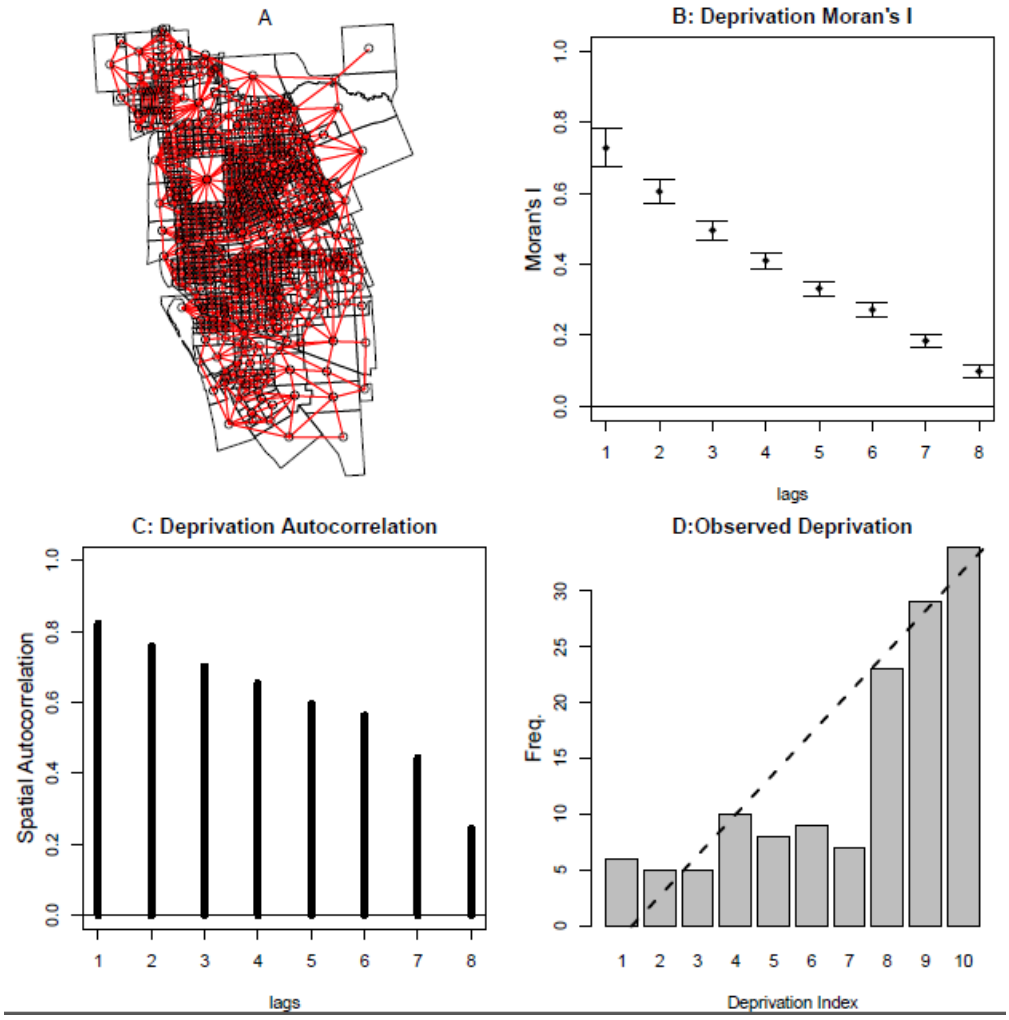
*Equivalisation: methods used to control for household composition. (Salmond et al., 2007)

Mesh blocks are geographical units defined by Statistics New Zealand, containing a median of approximately 87 people in 2006 (Salmond et al., 2007).

Figure 2 shows the mesh blocks for the Invercargill urban area, and the spatial Moran's I and autocorrelation measures (Cliff and Ord, 1981) for the deprivation index associated with each mesh block (Panels A, B, and C). Since observed SH episodes were not uniform across deprivation (Panel D), spatial clustering of SH was observed due to the underlying clustered social structure of the urban environment. Rehkopf and Buka (2005) have noted a similar relationship for suicide.

Figure 2

Panel A Shows the Small Area Mesh Blocks for Urban Invercargill



Note: The network represents the nearest neighbour connections used for spatial correlation. Clustering of New Zealand index of Deprivation s shown in panels B and C. Moran's I and the autocorrelation coefficient [2] are shown for increasing lag (steps) from any mesh block. The network model is used to determine the nearest neighbour (lag 1), 2nd nearest neighbour (lag 2), etc. Both measures show significant clustering of deprivation for several neighbourhood steps. The associated frequency of SH index episodes and deprivation is shown in panel D. The linear model (dashed line) has an adjusted R2 = 0.69.

Figure 3 shows the mesh blocks for the Invercargill urban area, with the deprivation quintiles.

Figure 3

Small Area Mesh Blocks for Urban Invercargill with the Deprivation Quintile

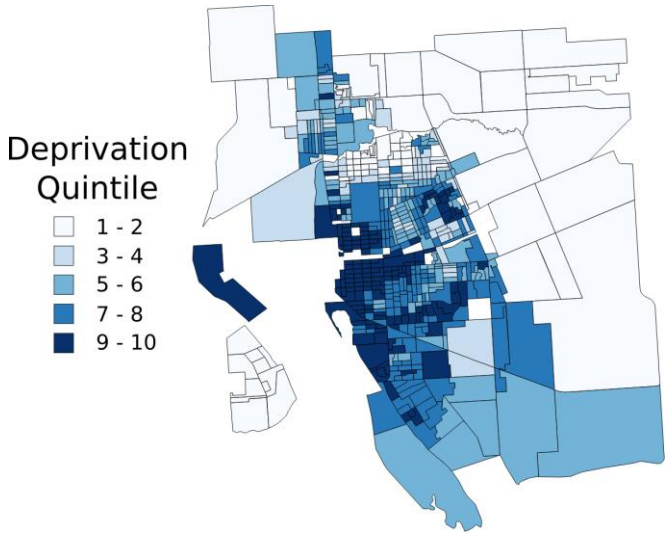
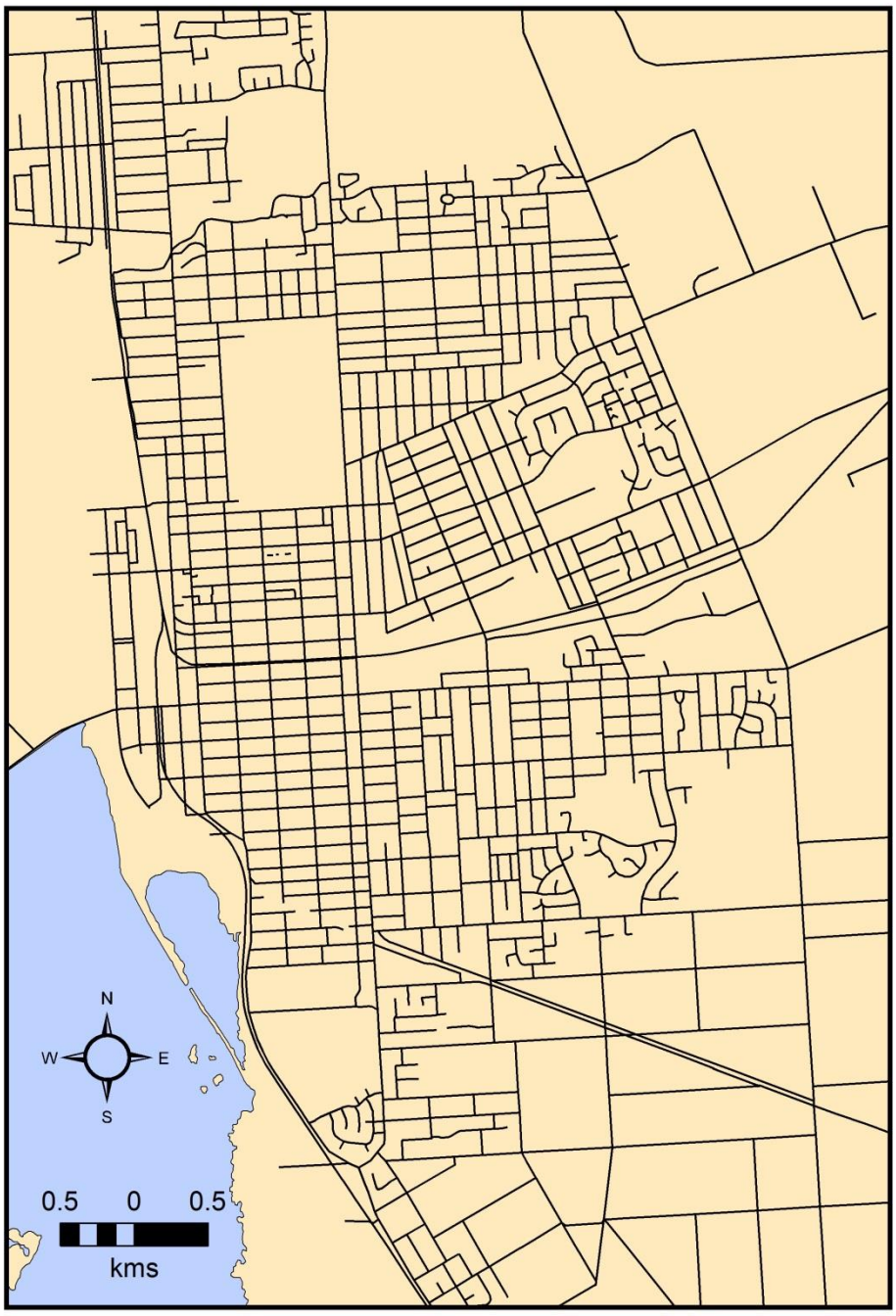


Figure 4 shows the road pattern for urban Invercargill. It is largely based on a grid (data obtained with permission from Land Information New Zealand (https://data.linz.govt.nz/).

Figure 4
Road Pattern for Urban Invercargill



Note: Data obtained with permission from Land Information New Zealand (https://data.linz.govt.nz/). Rotations of L1 will capture an approximate network road distance and the orientations of road sections.

Though Gould et al. (1994) had suggested the existence of social contagion for space-time patterns, no account was made for the inherent clustering of social structure. Normally social structure is accounted for through incorporating their description into a

regression model (see Baller and Richardson, 2002; Evans et al., 2004), however the use of a distance-based metric for clustering has no formal model for this type of integration. Hence, a Monte Carlo simulation is appropriate for determining the null hypothesis (Besag and Diggle, 1997) while removing the social clustering of deprivation as a model for SH.

For this Invercargill SH data, the set **x** corresponds to the centroids of each residential parcel, the set **y** corresponds to the observed index events, and the marks M = {1…10} are the deprivation index. The grid-like pattern of roads within urban Invercargill (Figure 3) justifies the use of rotated L_1 distance measures to reduce the bias with Euclidean distance and increase confidence in any observed clustering of SH.

5.2.2 Statistical Analysis

The second-order moment (Ripley's K) for an unlabeled, homogeneous, isotropic point process observed as a set of points $x_i \in \mathbb{R}^2$ is defined as: $K(r) = \lambda^{-1} E$ [number of other points in the process within distance r of a point from x_i] where λ is the intensity of the point process per unit area (Diggle and Chetwynd, 1991). For an isotropic process comparisons with K(r) are normally based on the homogeneous Poisson process $Kpois(r) = \pi r^2$ (Anselin and Ray, 2010). For this type of process λ is approximated as the number of points / observed region area. For our derivation of K(r), observations are constrained to a finite set of possible locations. Hence λ is set to the number of points / (maximum observed Euclidean distance between any two points in x_i).

Consider a set of n possible point locations in a finite region of the plane W. Note that W is not explicitly used; however, the locations are bounded. This unordered set of points might be defined as:

$\mathbf{x} = \{x_1, \ldots x_n\}\ x_i \in W,\ n \geq 0$

Each point x_i has an associated mark from a finite set of marks M, defining a marked point pattern:

$\mathbf{y} = \{(x_1,m_1),\ldots.,(x_n,m_n)\}, \quad x_i \in W,\ m_i \in M$

We observe a set of q marked points $\mathbf{q} \in \mathbf{y}$, where q < n, and want to determine if the set **q** deviates from complete spatial randomness. In addition, since the marked pattern may be spatially correlated to the process generating the point pattern, the distribution

of the observed marks of **q** must be taken into account when simulating a random sample from **y**. Initially (since q is fixed), we construct the discrete cumulative distribution function for the **q** marks as:

$$F(X) = \sum_{k=1}^{q} \Pr[X = m_k]$$

K(r) is now defined over a set of distance thresholds $r_i \in \mathbb{R}$ for one Monte Carlo simulation as follows:

For each distance threshold r_i,

1. P = {}
2. Repeat until q points have been selected:

2.1 Draw a uniform random number $\rho \in (0,1)$.

2.2 Determine the mark m_k for $F(\rho)$. This corresponds to a proportional selection of a mark value from the frequency distribution of marks for the observed pattern.

2.3 Select the subset of points $\mathbf{t} = \{(x_i,m_i) \in \mathbf{y}: m_i = m_k\}$ that correspond to this mark.

2.4 Randomly select a point $s \in \mathbf{t}$

2.5 $P = P \cup s$

3. The number of points from the set of points P within the Minkowski Distance L_2 (Euclidean distance) r_i is defined as $K(r_i) = \lambda^{-1} P$.

This method does not assume that the observed marks are clustered, but takes into account their spatial structure when determining K(r). For our case study we show that the effect of taking socio-economic structure (defined as a deprivation index) into account has a significant effect on the estimate of clustering (see Results section).

Multiple simulation runs allow an envelope to be constructed. For a one-sided 5% significant level for q observed points, the above simulation is performed 1,000 times to define a reference set $\widehat{K}(r_i)$. For each distance r_i the $\widehat{K}(r_i)$ are sorted. A 5% significance level for the clustering of observed $K(r_i)$ means that $K(r_i)$ is greater than the 951st observed value of K from the reference set (Yamada and Thill, 2004; Hope 1968).

Addressing distance bias:

The use of L_2 distance on the plane (step 3 above) assumes a barrier free, isotropic measure for the distance between points. From a social contagion perspective it is difficult to know what, if any, planar distance is appropriate for the connection between any two-index events. In addition, social media and other forms of communication mean that a spatial distance may not be appropriate. Since Ripley's K requires a distance measure, we would like to confirm that L_2 distance does not significantly influence the results.

Consider the Minkowski distance L_1 (Manhattan or rectilinear distance) defined between two points a (x_1, y_1) and b (x_2, y_2):

$$L_1(a, b) = (|x_1 - x_2| + |y_1 - y_2|)$$

Although L_2 is invariant under rotation, L_1 will vary between the x-axis only and y-axis only difference as the point set **x** is rotated about the origin. Hence to examine the influence of distance bias, step 3 can be extended by considering a set of rotations $\boldsymbol{\theta}$ between 0 and 90° using L_1:

4. For each rotation $\theta_i \in \boldsymbol{\theta}$
    a. Rotate the original observed points **q** by θ_i and compute Ripley's K using L_1 distance.
    b. Rotate the set of points **s** by θ_i about the origin to form the set **s´**.
    c. For each distance threshold r_i count the number of points in **s´** within the Minkowski Distance L_1 (Manhattan distance) d_i from each point in **s´**.

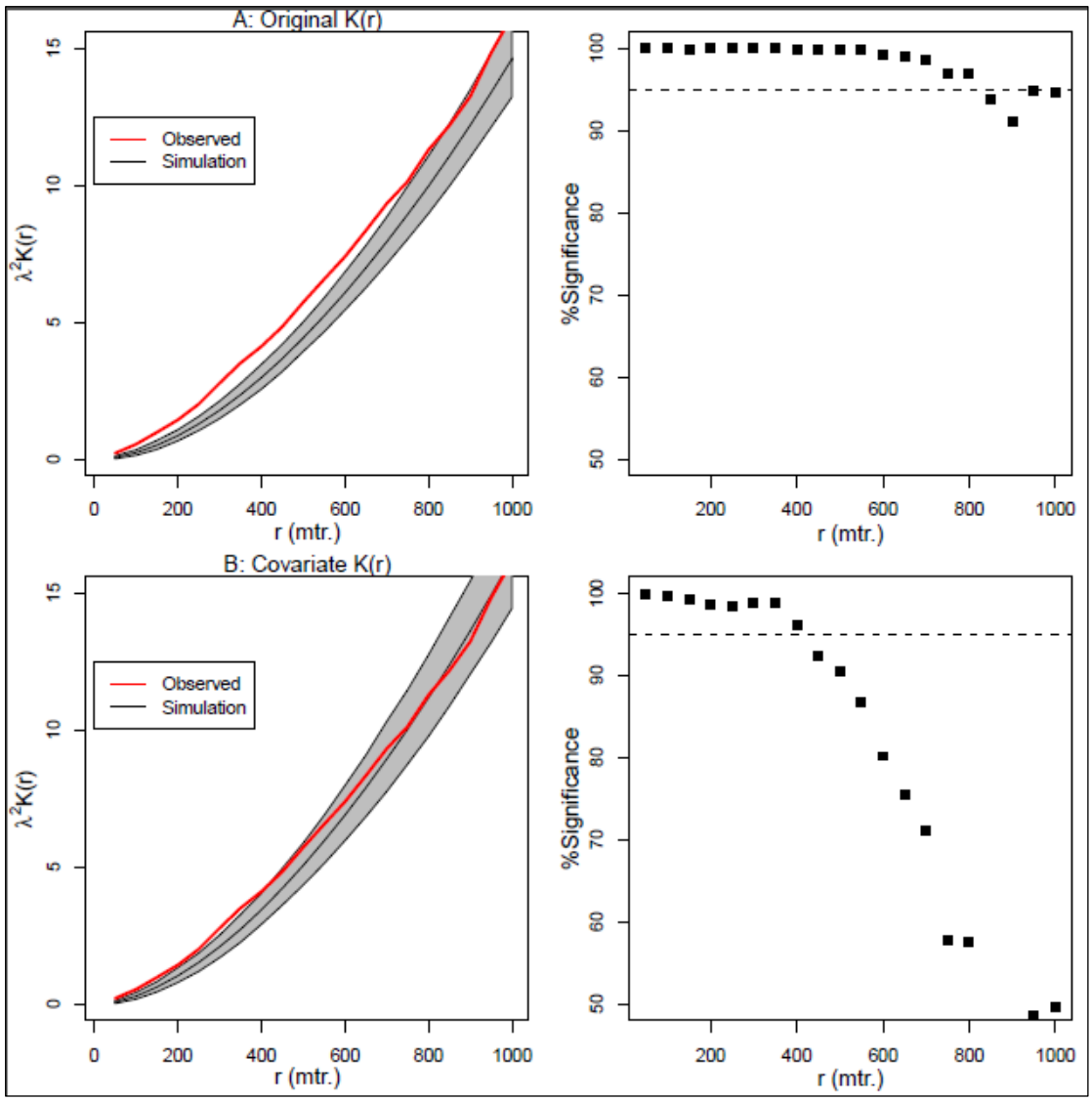
This metric is clearly justified for grid-like road patterns but may also be used when the geographic distance between points is difficult to define or involves some uncertainty.

5.3 Results

Figure 4 shows K(r) estimated with uniform mark distribution (Panel A), and when the covariate distribution of deprivation index is taken into account (Panel B). Note that the y-axis is calculated as $\lambda^2 K(r)$, which gives the expected number of points within r of an observed point. Panel A shows that without accounting for social structure (deprivation), clustering of index episodes is significant for all distances up to ~800m.

However, Panel B evidence for clustering is only apparent up to ~500m once deprivation is accounted for when estimating K(r).

Figure 5
K(r) using Euclidean Distance (L2)

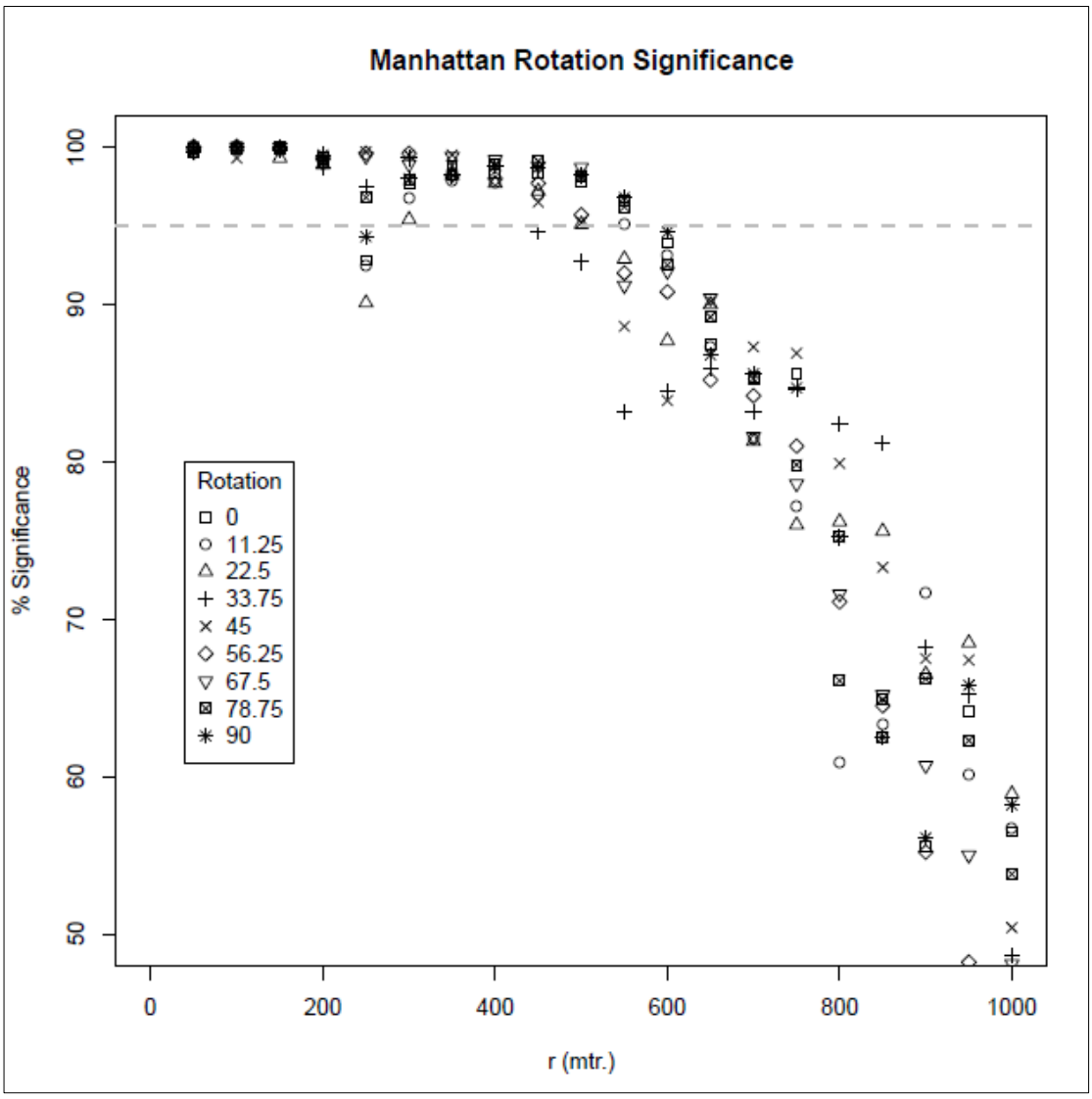


Note: Panel A (left) shows K(r) when the social structure of deprivation is not taken into account. Panel A (right) shows the significance level above the median envelope K(r) value for clustering occurs up to ~800m. The dashed line shows the one-sided 95% confidence interval. Panel B (left) shows K(r) after clustering once deprivation is removed. Panel B (right) shows that significant evidence for clustering reduces to ~500m.

Figure 6 shows a range of K(r,θ) values using L_1 distance. Although some rotations (such as 22.5°) were below the 5% threshold of evidence for clustering, it is apparent that for almost all rotations, clustering was significant up to ~500 m.

Figure 6

One-sided Significance Measures for K(r) Using Rotation of Observed and Simulated Events with Manhattan Distance



Note: The dashed line indicates a one-sided 95% significance level.

5.4 Discussion

The original formulation of the second-order estimate for clustering K(r) assumes a stationary process generating the intensity of observed points and no constraint regarding the placement of points in the study area. However, there are many situations where the possible observation of a point in space is constrained due to the nature of the observed process, or through explicit constraints in the way that the defining space is created. For example, a residential analysis of patterns assumes that people live at valid addresses that do not include parks, businesses, etc., while an analysis of road

accident clustering is constrained to locations on a road network. The use of individual data for health analysis will increase with improved data collection and the linked integration of data sets. The method presented here addresses some aspects of how to consider spatial clustering when individual data is used within a constrained spatial region and where a clustered covariate relationship exists. The results for SH clustering, as shown in Figure 4, show that once social structure is accounted for there still exists evidence for clustering up to ~500m. This clustering may suggest aspects of social contagion (Baller and Richardson, 2002) especially given that evidence for clustering is demonstrated with the rotated L_1 metric.

Social media plays an important role in the means of communication, which makes the issue of clustering and distance metrics a difficult concept to manage and quantify. Physical closeness does not remain a requirement for proximity and social influence (Duggan and Whitlock, 2012). However, since social networking tools like Facebook, Instagram, and Twitter do not depend on location, SH that derives from these influences should be spatially random once clustered covariates are managed.

There is evidence for clustering as shown in Figure 5. It suggests that there is a physical (geographic) relationship between individuals and SH, although the study here has a number of limitations. The data set was from an audit of two years of observations, and for only a single community. Both of these aspects limit any generalisation. Further studies to extend the data collection period and range of urban settings would be useful. In this study, deprivation index has been used as a single covariate for clustering, however there could be other clustered covariates, such as alcohol outlets (Hay et al., 2009; Huckle et al., 2008), that could contribute to the observed pattern for SH clustering.

This problem can be handled by extending the marked point pattern probability method to incorporate a multivariate density analysis (Scott, 1992) to create a probability surface for selecting fixed locations. Many physical constructions, such as alcohol outlets, are also often correlated with deprivation (Hay et al., 2009), which means that handling a single variable that captures socio-economic structure is sufficient for estimating SH clustering. Further work is required to determine the impact on clustering estimation with other configurations in the urban environment.

As Invercargill is a small urban area and the study was only for a short period of two years, the concept of stationarity in space and time was not considered. However, although a longer time period and/or larger urban centre would produce a greater number of cases, this would also increase the possibility of non-stationarity in the clustering behaviour. This would require additional methods for both detection and handling. Concepts such as non-stationarity in space and time are difficult to manage when assessing clustering and a likely solution would be to treat the clustering algorithm as a set of local statistics (Anselin, 1995).

5.5 Limitation

The main limitation is that the study period was restricted to only two years of observation and is only for a small centre. It would be useful to extend the data collection period, and also conduct similar studies at other centres in both developing and developed countries to generalise the geographic relationship of individuals and clustering in SH.

This study only included data from retrospective file audit. The intent behind the act of SH was not known. A similar prospective study where intent is also studied would help us understand the phenomenon of clustering and to see if there is any relationship between high intent of SH and clustering. It would help us to understand if the intent of SH allows the spread to previously SH naïve individuals, especially in a closed unit such as psychiatric inpatient units. A prospective study of an inpatient community would also allow us to see whether the clustering of SH was limited only to cutting, as in Taiminen et al.'s study (1998) or if it involved other forms of SH as well.

5.6 Conclusion

This study has supported previous work on the influence of social deprivation on clustering of SH in a small urban centre (Okabe and Yamada, 2001). There is also evidence for social contagion for SH at small distance scales.

The presented finite point Ripley's K approach has allowed an assessment of point-based observations, while handling a spatially clustered covariate and addressing distance bias. It highlights social contagion as a likely influence for SH at small distance scales within an urban centre. Further studies of SH in other urban and rural areas

should be conducted nationally to see if this relationship can be generalised across different communities.

Chapter 6: Discussion

6.1 Introduction

This study aimed to provide an analysis of a range of factors associated with SH in urban and rural populations presenting to hospital with SH. Factors included sociodemographic status and psychiatric disorder, and stressors such as childhood sexual abuse, stressful situations in life, ongoing alcohol and cannabis (and synthetic cannabis) use, and violence. The findings of the study will be discussed under the following headings:

6.2. Principal findings in the population presenting with SH to Southland Hospital.

6.3. Principal findings in children and young adolescents presenting with SH to Southland Hospital.

6.4. Principal findings of the five-year national trends in SH.

6.5. Principal findings in clustering of SH in Invercargill.

6.2 Principal Findings in the Population Presenting with SH

Key objectives -

1. To compare rates of hospital presenting SH in urban and rural population in Southland

2. To see the difference in the clinical profile of the individuals presenting with SH to hospital from urban and rural areas to help inform clinical service delivery

Key findings -

- *SH was more frequently seen in people from urban areas compared to rural areas.*
- *SH was more often seen in females compared to males in both urban and rural areas.*
- *SH was more in single, less educated and those who were unemployed in the urban participants.*
- *Urban Māori were more likely to attend hospital with SH in relation to Māori from the rural areas.*
- *A positive family history of SH behaviours was noted in a small number of patients from both urban and rural areas.*
- *Psychiatric comorbidity is common in patients with SH; depression, borderline personality disorder and alcohol dependence being the most common in both urban rural areas.*
- *Alcohol use was noted to be present in about half of the participants from both urban and rural areas.*

- *Self -poisoning was the most common method of SH in both urban and rural areas. Cutting was the second most common method. Hanging, gunshot injuries, strangulation and drowning were the other methods.*
- *History of childhood sexual abuse was associated with SH and repetition of SH*
- *History of violence was noted in some patients from both the urban and rural areas.*
- *Relationship breakup was the most common stressor for SH and was more commonly seen in patients from urban areas compared to patients from rural areas.*

This study noted a preponderance of females among those presenting to the hospital with SH, consistent with other local and international studies (Beautrais et al., 2005; Harriss and Hawton, 2011; Collings and Beautrais, 2005; Hawton and van Heeringen, 2000). Individuals who were single, less educated, and unemployed were more likely to attend hospitals with SH. Unemployment (Gunnell et al., 2004; Milner et al., 2013) and socio-economic deprivation has been associated with SH and suicide in other studies as well (Ayton et al., 2003; Robinson et al., 2017; Chan et al., 2018). Māori were more likely to attend with SH in relation to the proportion of Māori in the general population. This is in line with the findings of other international studies, which have found higher incidence of SH in ethnic minority groups (Fortune and Hawton, 2007; Beautrais et al., 2006; Harriss and Hawton, 2011; Bhui et al., 2007; Cooper et al., 2010; Cross et al., 2014). Studies have shown that factors that may help protect or predispose individuals to SH (such as religion, mental health, and coping styles) also differ between ethnic groups. Awareness of these factors may help to prevent further attempts of SH (Al-Sharifi et al., 2015). It is not just the socio-economic deprivation in Māori that increases their risk to SH but also the complex effects of colonisation including dispossession of land, language, and disadvantage (Beautrais et al., 2005).

SH in this study was more frequent in individuals residing in urban areas of Southland compared with rural areas, which is consistent with other studies (Harriss and Hawton, 2011; Corcoran et al., 2007; O'Farell et al., 2015; Fadum at al., 2013). One explanation is that individuals from urban areas present to hospital post-SH because of easier accessibility to hospital care. Differences in perception of SH and help-seeking behaviour have also been suggested as possible reasons for the greater number of adolescents in

urban areas presenting to health services with SH without suicidal intent (Fadum et al., 2013).

There is a range of family interactional factors associated with self-harming behaviours in young people (Fortune et al., 2016). This study found a positive family history of SH in a small number of patients only, in contrast to the current literature (Hawton et al., 2002a), which could be due to the small sample size and retrospective design of the study where counts were based on the recorded history, and is likely an underrepresentation.

A history of childhood sexual abuse was associated with SH and repetition of SH in this study. This is consistent with other studies (Johnson et al., 2002; Fergusson et al., 2000; Dube et al., 2001). CSA was noted more in the urban population compared to the rural population in this study. There is a possibility that it was being reported more in the population from the urban area. Due to the retrospective design of the study, if childhood sexual abuse had not been reported, it was considered 'as not present', leading to an underestimation of childhood sexual abuse in this study.

This study found that psychiatric co-morbidity was present in the majority of patients presenting with SH; the most common psychiatric diagnoses being depression, borderline personality disorder, and alcohol dependence. These results are consistent with other studies (Haw et al., 2001; Oumaya et al., 2008; Krysinska et al., 2006; Skegg, 2005). Alcohol dependence was noted in a similar proportion in males and females from urban and rural areas presenting to hospital with SH, which is consistent with an earlier report (Hawton et al., 1989). Cannabis dependence and polysubstance dependence associated with SH were noted more in the urban population, which is also consistent with previous studies (Hawton et al., 1989; Philip et al., 2012; Haw and Hawton, 2011; Gilletta et al., 2012). Individuals who engage in substance abuse (Moler et al., 2013) and alcohol abuse (Riedi et al., 2012) are more likely to engage in SH.

In this study, a history of violence was associated with SH in a proportion of SH episodes from both urban and rural areas (urban = 25.2%; rural = 20.8%). This finding was consistent with other studies (Hawton et al., 2013; Sahlin et al., 2017; Goldman-Meller et al., 2014; Boyle et al., 2006). It highlights the importance of screening for family violence in patients presenting with SH. Acknowledging the personal, psychological,

social, and medical costs of intimate partner violence (IPV), healthcare in New Zealand has developed policies for routine IPV identification (screening) and interventions (Fanslow and Kelly, 2016). Implementing IPV screening has been difficult due to lack of provider education, fear of offending patients, limited time, and a lack of effective interventions (Waalen et al., 2000; Sugg and Inui, 1992). In clinical practice, strategies for identifying IPV should include relevant questions in patient histories, screening during routine examinations, and a high suspicion in patients with suggestive signs or symptoms. Clinicians should also be familiar with the local and national resources available for these patients (Cronholm et al., 2011).

Self-poisoning (on prescription medications, over the counter medications, and gas) was the most common method of SH seen in this study. However, accurate details of specific medications used in individual SH episodes were not available for further analysis. Restricting access to medications appears to be a relatively easy preventative strategy for SH, as has been shown in the UK where changes in legislation around paracetamol availability have seen a reduction in the incidence of SH by paracetamol poisoning (Hawton et al., 2013a). Similar reduction in the incidence of SH can be expected by restricting amounts dispensed to patients (e.g., weekly dispensing). Limiting access to medications does not rule out the possibility of stockpiling medications, but it nevertheless reduces risk of SH by overdosing. Cutting was second most common SH method in this sample. Methods used for SH often fluctuate, and switching between methods of SH is common. Studies have shown that about one third to almost half of patients presenting with SH (33%) switched methods over time (Owen et al., 2015; Witt et al., 2019). Self-poisoning has been shown to be far less likely to lead to switching (Owen et al., 2015). It is not clear if there is an association between preference for a particular method of SH, availability of the method, or how quickly an individual might change the SH methods. Miller et al. (2013) have suggested the possibility that individuals adopt methods with higher case fatality ratios than their previous attempts. Hence, irrespective of the method used at the index episode, all patients should be routinely assessed for risk if they re-present using different methods for SH. During the study period, there were two deaths by suicide in the individuals who had presented

with SH to the hospital during the study period. This information was ascertained from the list of the deceased patients and their causes of death.

6.3 Principal Findings in Children and Young Adolescents Presenting with SH

Key objectives *- To study SH in children and youth below 15 years presenting to Southland hospital.*

Key findings-

- *SH was noted in children between the ages of 9-15 years.*
- *There was a preponderance of SH in females.*
- *There was an association of SH in young individual and a family history of SH /suicide, history of childhood abuse, parental breakup and difficult relationships/arguments (parents, boyfriends and girlfriends).*
- *Psychiatric comorbidity, previous history of SH, school/academic problems school bullying, recent alcohol, cannabis and synthetic cannabis use were other factors associated SH in children and young adolescents.*

In this study, the youngest individual presenting with SH was 9 years of age; the majority of youth were between 14 and 15 years of age. The age distribution of SH in young people was similar to those reported in a 26-year longitudinal study (Hawton and Harriss, 2008). Similar to other studies, there was a preponderance of SH in females (Nadkarni et al., 2000; Geulayov et al., 2018; Hawton and Harriss, 2008; Martin Reith et al., 2003; Fortune et al., 2005; Hawton and Harriss, 2008; Hawton et al., 1982).

There was an association noted between SH in young individuals and a family history of SH/suicide, history of childhood abuse (sexual and physical), arguments or problems with family, and parental breakup. This study, however, showed that positive family history was more prevalent in those who had overdosed compared to those who had used other means of SH. A positive family history of SH/suicide increases the risk of suicide in youth. Hawton et al. (2002a) reported that positive family history, in absence of other associations, is related to the initiation of SH in young people. Parents with a history of SH may model SH for their children (Wagner et al., 2003). As we know, SH in itself is not a mental health diagnosis and it may not always be related to mental illness. It would be useful to extend the principles of COPMI (Children of Parents with a Mental

Illness), as per the Royal Australian and New Zealand College of Psychiatrists guidelines (RANZCP Guidelines, 2016), to families with SH. SH in parents may have an impact on the well-being of children as well. Clinicians should pay extra attention to young individuals presenting with SH with a positive family history of schizophrenia (Ljung et al., 2013), family history of alcohol abuse/dependence (Rossow and Moan, 2012; Bridge et al., 2006), and family history of depression (Melhem et al., 2007; Bridge et al., 2006), as the risk of SH is increased in this group of adolescents.

History of childhood abuse (sexual and physical abuse) was noted in SH in this sample of children and young adolescents, which is consistent with other studies (Eisenberg et al., 2007; Fergusson et al., 2003; Martin et al., 2004; Fliege et al., 2009; Fortune et al., 2005). The contribution of physical abuse in absence of sexual abuse in individual SH cases was not studied separately. The presence of childhood abuse, both sexual and physical, requires careful intervention. For clinicians, it is important to assess whether the young person is at risk of ongoing abuse and whether the person is safe to return home in the care of elders. Most district health boards have mandatory reporting policies, and a report of concern to Oranga Tamariki (for care and protection of young person) may have to be considered to modify the risks for SH in young people. In New Zealand, while reporting child abuse is not mandatory, the Vulnerable Children Act 2014 prioritises the identification of vulnerable children and communication between professionals to facilitate child protection (New Zealand Government, Children's Action Plan; 2014). Clinicians need to be aware that managing these young people involves not only the immediate care for the index SH episode, but also ongoing psychological support and a safe environment.

There was an association noted between difficult relationships/arguments (with parents, girlfriends, and boyfriends) and SH in this study. This finding has been consistent with other studies (Hawton and Harriss, 2008; Hawton et al., 2012; Palmer and Martin, 2016; Gould et al., 2003; Wagner et al., 2003; Crowell et al., 2008). A difficult relationship/arguments with family at the time of SH has implications on aftercare of SH as children might refuse to return home, or families might be reluctant to take children back home, which, for safety reasons, might result in an inpatient admission post-SH by default even when admission is not warranted. Lack of family

support and lack of community resources (such as respite beds in the community for young people) potentially could have been a reason for high numbers of mental health inpatient admissions in this study compared to a smaller proportion of inpatient psychiatric admissions post-SH in another study from the UK (Hawton and Harriss, 2008).

Inpatient admission for SH in young people may have its own challenges. Southland Hospital, being a small hospital, does not have a separate unit for children and adolescents. Anyone above 16 years of age can be admitted to the adult psychiatric inpatient unit with a constant watch, where either a family member or staff member is present with the patient for 24 hours. Younger patients are admitted to the paediatric ward. Even with a close watch, their experience on the psychiatric ward is not always the best. There is a risk that their self-harming behaviour might worsen, though this was not evaluated in this study. There is some evidence to suggest that children who are admitted to hospital as a result of serious injuries/poisonings have a higher risk of SH in the future as the experience increases their vulnerability (Webb at al., 2017). Adrian et al. (2020) have recently shown that psychiatric hospitalisation after SH is strongly associated with a recurrence of SH in the following year in children and adolescents between 6 and 18 years old. Occasionally patients may SH while an inpatient (Barton et al., 2001; Phillips et al., 2012; Zhand et al., 2016). Clinicians and families together should endeavour to manage young people presenting with SH closer to their home environment as much as possible. One should always attempt to manage them in such a manner that admission to the hospital does not reinforce SH behaviours.

While managing SH in young people, efforts should be made to also teach them to problem solve and encourage individuals/families to receive appropriate counselling to improve conflicts and relationships. This may help to reduce the risk of repeated SH. Family involvement in care of SH in young people is more effective in those who report both poor family functioning and ease in discussing emotions (Ougrin and Asarnow, 2018).

Parental breakup was associated with SH in this study, similar to the findings of other studies (Kosky, 1983; Beautrais, 2000a; Kokkevi et al., 2012). Children and young adolescents may struggle with parental breakup. SH may be a means of getting their

parents together and hence clinicians should support the child psychologically through such breakups. If parents are willing, they should be offered counselling as well. Facilitating and improving 'parental support' and attempts to increase the perception of support may protect young persons against SH (Fortune et al., 2016).

At the individual level, principal factors that were associated with SH in my sample were presence of psychiatric co-morbidity, previous history of SH, school/academic problems, school bullying, and recent alcohol, cannabis, and synthetic cannabis use. These factors can be conceptualised to provide a profile for 'at-risk' individuals who have these sociodemographic profiles and who may benefit from more intensive management to minimise and prevent SH. Use of illicit substances at a young age is a public health concern in itself. Whether young individuals presenting with SH accept drug and alcohol counselling is a different issue, but efforts should be made to incorporate drug and alcohol counselling as a follow-up strategy. Young individuals need to be encouraged to report school bullying and if they and their parents agree, then clinicians could liaise with school counsellors to help them provide wrap-around support to young individuals deal with the bullying.

6.4 Principal findings of the Five-Year National Trends of SH in New Zealand

Key Objectives *- To study multi year national SH trends in children and younger adolescents, 15 years and younger in NZ (Between 2008-2012)*

Key findings-

- *Only a small proportion of all cases were below 15 years of age.*
- *SH was rare before the age of 11 years and case numbers increased exponentially.*
- *A female preponderance of SH was noted.*
- *Overdose was the most common method of SH in youth of New Zealand.*
- *An association of SH with deprivation scores was observed.*
- *Deprivation scores were related to SH rates in European/Pakeha and Māori youth but not in Pacific youth.*
- *A higher incidence of psychiatric diagnosis was noted in the individuals who repeated SH as compared to individuals with single episode of SH.*
- *Rates of deprivation was similar in the two groups of individuals with single episode of SH and multiple episodes of SH.*

- *Hanging and strangulation as means of SH was more common among Māori compared to non- Māori.*
- *An overall 113% increase was noted in SH cases over five years.*
- *Psychosocial issues like relationship difficulties with parents/ friends and problems at school were noted with SH in youth nationally.*

The analysis of the five-year national trends in New Zealand found that only a small proportion of all cases were below 15 years of age. SH was rare before the age of 11 years and case numbers then increased exponentially. There was a female preponderance, and the most common method of SH in youth of New Zealand was overdose. There was also an association of SH with deprivation scores. A lower representation of SH in Pacific young people was noted. Deprivation scores were related to SH rates in European/Pakeha and Māori youth but not in Pacific youth. A higher incidence of psychiatric diagnosis was noted in the group of individuals who repeated SH compared to the group with a single episode of SH, though rates of deprivation were similar in the two groups. Hanging and strangulation, as means of SH, were more common among Māori compared to non-Māori. The analysis of the data highlights the importance of aftercare and intensive follow-up in cases of SH where potentially lethal means of SH have been used. Māori are overrepresented in youth suicide, with hanging and strangulation the most common SH methods (Suicide Facts, MOH 2016).

The study also identified an overall 113% increase in reported cases of SH over five years in New Zealand. This is considerably greater than the 66% increase reported in a UK study over 26 years (Hawton and Harriss, 2008). Though this could partly reflect differences in the practice of coding of SH, it still is an indication of how SH involves the youth of the nation at an alarming rate.

As noted in the previous section on the principal findings in SH in children and adolescents, psychosocial issues, such as relationship difficulties with parents or friends, and problems with schoolwork were associated with SH in youth nationally. Psychiatric co-morbidity was seen only in a small proportion of the patients. This was similar to other studies (Hawton and Harriss, 2008; Hawton et al., 1996). Based on the results of this study there is a possibility of subgrouping of youth SH; first, a larger group of socially deprived patients with single episodes of SH and low association of psychiatric

disorder, and second, a smaller group with a higher proportion of multiple attempts of SH and psychiatric diagnoses. This was an exploratory finding and would need to be replicated in future research.

6.5 Principal Findings of the Clustering of SH in Invercargill

Key Objectives *- To see whether clustering of SH was present and if socioeconomic derivation was a variable contributing to SH.*

Key findings

- *There was a clustering up to ~500m, suggesting a social contagion.*
- *Deprivation index was noted to be contributing to clustering of SH.*

The findings of this study suggested that once social structure is accounted for, there was a clustering up to ~500m, suggesting social contagion, as shown in other studies (Baller and Richardson, 2002; Chan et al., 2018). This finding highlights the impact of exposure to SH within friends and family and its effect on the mental health of the individual.

Deprivation index was studied as a single covariate for clustering in this sample, although other covariates like alcohol outlets could also contribute to clustering. Physical constructs like alcohol outlets are often correlated with deprivation (Hay et al., 2009). Looking at a single variable that captures socio-economic structure is often sufficient for estimating SH clustering (Whigham et al., 2016).

As SH increases risk of suicide, awareness of clustering of SH in the community calls for an effort to develop plans prospectively, such as SH surveillance programmes. Though geographical proximity increases the risk of SH clustering in vulnerable individuals, social and psychological proximity can also be used to identify individuals who are at risk for a contagion of suicide and self-harm behaviour (Zenare, 2009).

Physical closeness does not remain a requirement for proximity and social influence (Duggan and Whitlock, 2012). Digital technology has led to people, primarily youth, remaining connected with their peers. Various internet pathways have been shown to increase the risk of suicidal behaviours and SH in adolescents and young people (Durkee et al., 2011). Different social networking sites like Facebook, Instagram, and Twitter do not depend on a location, and hence, SH influence through these sites should be

spatially random once clustered covariates are managed. On the one hand, digital technology has in some ways increased the risk of suicidal behaviours; on the other hand, digital interventions have demonstrated some positive impacts for individuals who are at high risk for suicide and SH, including reduction in depression, psychological distress, and SH, and increase in coping and self-efficacy (Melia et al., 2020).

6.6 Limitations of this Study

The limitations of the study need to be acknowledged.

1. Only patients presenting to Southland Hospital with SH were studied. This likely represents a minority of patients and may not be generalised to the whole population, and may not be reflective of SH occurring in the community.

2. Psychiatric diagnoses were primarily clinically based. Structured diagnostic interviews were not used due to the emergency/liaison set up of the evaluation of patients when they were seen post-SH.

3. The presence or absence of suicidal intent with the index episode of SH was not reported. It would be useful to conduct a prospective study where suicidal intent was also measured using validated instruments, although these are likely to have limited utility, as shown by Carter and Spittal (2018), who suggest that risk stratification is often inaccurate to be clinically useful and might even be harmful. Checking for suicidal intent to assess risk may also be challenging in clinical situations because it might rely on patient self-report. Suicidal patients may conceal their plans and hence accurate methods to predict suicide may remain elusive (Bolton et al., 2015).

4. Patients were evaluated on a semi-structured form at the time of the evaluation post-SH. The impact of specific unmeasured characteristics of ‘fear of stigma' cannot be ruled out. This may have direct or indirect effects on how much information was reported by patients and their families. This could also have an impact on varying degrees of use of health services in urban versus rural settings.

6.7 Implications of Research Findings

There may be different social and cultural factors that influence suicidal behaviour in Māori, such as alienation from traditional Māori culture and social institutions that provide support (e.g., connection to whānau, hapū, and marae); poor self-concept and

lack of Māori identity, especially for Māori youth; impact of negative social constructs of Māori; historical effects of New Zealand social and economic change to Māori population; adjustment to re-emergence of Māori cultural identity; and rapid changes in social values and norms (Hirini and Collings, 2005). There is growing literature that associates historical trauma as a key explanation for higher rates of indigenous suicides (Fast and Collin-Vezina, 2010; Kirmayer et al., 2014). The process of narrating trauma as an exercise has been suggested as a starting point for healing (Lawson-Te Aho, 2014). Storytelling makes individuals more conscious of the impacts of history on shaping their current realities, shows testimony about resilience of previous generations, and also helps individuals learn strategies utilised to cope with the brutalising effects of colonisation. Evidence of an association between historical trauma and suicide has not been well researched in New Zealand (Lawson-Te Aho, 2017). Given the lack of evaluative data, it is easy to undermine and disqualify real potential for specific preventive strategies for suicide and SH in Māori (Lawson-Te Aho, 2017). The Meihana model is a framework that facilitates the fusion of clinical and cultural competencies to better serve Māori within the mental health service delivery. It encompasses strengths and abilities of the clinician while taking into the account the needs of clients and their whānau (Pitama et al., 2014). Interventions to prevent SH in Māori need to be wide-ranging and culturally specific to Māori to be effective.

The primary factors of this study affecting SH are similar to factors associated with other disorders like depression and substance use disorders in adolescents and young adults, which are influenced by psychosocial factors. This suggests that significant life events like relationship breakups, arguments with family and partners, financial loss, and school/academic difficulties, which might contribute to SH, also overlap with factors leading to mental health disorders. This highlights the importance of including psychosocial assessments as an initial intervention for SH episodes. There is a possibility of under-reporting of previous SH due to stigma associated with mental health problems in society as well. Hence education and increasing awareness in schools and at the community level might help individuals to seek help earlier.

Contrary to popular belief that SH is ‘attention-seeking behaviour’ SH has been associated with psychiatric and medical co-morbidities. Students reporting low mood

have the highest risk of SH (Hawton et al., 2012; Chan et al., 2018). Depression was the most common psychiatric co-morbidity noted in this study, also. GPs in New Zealand manage many cases of mild to moderate depression. Some cases of self-harming behaviour associated with mild to moderate depression may not be presenting to hospitals. GPs can put in referrals for self-harming behaviour to specialist mental health services for early intervention, especially for young people. Addressing mental health conditions at the early stages is also a means to reduce the risk of SH. Effective treatment of SH has been shown to prevent presentations to services and reduce future health care costs (Kapur et al., 2013; Sinclair et al., 2011). Hence it is important to engage patients actively and manage them not only medically but to also integrate sociocultural factors, as shown in a recent review by Macdonald et al. (2020). It may be useful to limit the times the patient is required to retell their narratives as repetition can increase their distress, and clinicians should prioritise the complex emotional aspects of the patient's situation alongside the physical treatments, and clearly communicate the rationale for their particular provision (Macdonald et al., 2020).

Though there is little indication that intensive intervention plus outreach is effective in the management of SH in the Cochrane review (Hawton et al., 1999), community follow-ups improved after home visits in those patients who did not attend; the repetition of SH also decreased (van Heeringen at al., 1995). A trial of home treatment has also been shown to improve the take up rate of treatment (Hawton et al., 1981). Assertive outreach/home-based treatment programmes for poorly compliant patients may maximise the delivery of any treatment. In the aftercare of individuals post-SH, follow-up via an acute home-based treatment team is an achievable means to reduce SH.

Due to resource shortages, medical cover in rural areas may not be sufficient, and home-based treatment may be difficult to consider. Telepsychiatry can be used to provide support and follow-up post-SH. If patients can come to a local centre, which has the facilities for telepsychiatry, clinicians can provide follow-up care and even therapy, meaning time could be saved and more patients could be seen in a day. Telepsychiatry provides comparable patient and provider satisfaction and equal outcomes when compared to face-to-face encounters (Gardener et al., 2020). The effectiveness of telepsychiatry has not yet been studied in patients who SH. Comparative studies are

needed to identify which models of telepsychiatry would be most appropriate for patients with complex psychiatric disorders (Fortney et al., 2015).

There is an ongoing need to restrict access to potentially lethal means of SH. Stricter dispensing of medications, such as weekly or twice weekly, could be considered for individuals at high risk of overdosing. However, this would still carry the risk of individuals stockpiling medications. Blister packing of the medications, or less frequent dispensing in patients at high risk of SH may reduce the risk of overdose. Providing medication oversight is another option, though the aim should be to make the individuals responsible for their medications in the long run. Legislation around reducing the availability of paracetamol and other pain medications in supermarkets should be a national priority, as has been shown in France and the UK where paracetamol-related mortality and morbidity was reduced when the quantity of paracetamol in a single purchase was limited in the late 1990s (Gunnell et al., 1997; Greene et al., 2006).

To improve prevention strategies for SH, future studies could look at distinct mechanisms of SH in males and females within ethnic groups. A future study comparing community-based surveys of SH and hospital SH may help to broaden understanding and help services to implement better preventive strategies.

Digital technology can be used to help prevent SH in people who enjoy using isuch technology. It can be used for e-therapy, and can help with emotion regulation as well. An online tool, Sparx, (www.sparx.org.nz) is a free tool for young individuals with depression. It uses cognitive behavioural therapy in a youth friendly interactive game format. The role of social media in SH can be explicitly studied.

The Suicide Prevention Strategy 2019–2029 in New Zealand (Ministry of Health, 2019) outlines the framework and strategic direction to achieve the vision of no suicide in New Zealand. The two key outcomes are reducing suicide rates and achieving well-being for all. It focuses on increasing the protective factors and reducing the risk factors for suicide. SH remains an important modifiable risk factor for suicide. It is important to reduce the incidence of SH as well, which can be applied under the following steps of the Suicide Prevention Strategy:

1. Promotion: promoting well-being. Anti-bullying strategies at school and public awareness campaigns might help people seek help early on, helping them to maintain their well-being.
2. Prevention: responding to suicide distress. Education and training of teachers, NGOs, Oranga Tamariki, Work and Income New Zealand (WINZ), and provision of counsellors at schools and health centres. Adults dealing with young people with SH should be able to talk to them in a calm and non-judgemental manner.
3. Intervention: responding to suicidal behaviour. There can be easy access to crisis lines/mental health emergency teams and helplines to target people in distress who may need help to regulate their emotions and prevent SH.
4. Postvention: supporting people after suicide.

The Suicide Prevention Strategy has not specified the ways it hopes to achieve its results. Positive results may not transpire, as there may be some difficulties encouraging non-mental health professionals at places like Oranga Tamariki and WINZ to take on the role of trying to prevent SH and suicide.

6.8 Conclusions

This study found the rates of SH of those presenting to hospital to be higher in individuals who lived in urban areas compared to individuals who lived in rural areas in Southland, New Zealand. It is possible that some episodes of SH in rural areas may not present for treatment at the hospital due to their distance from the hospital. This could have concealed individuals with high suicide intent. SH was also seen in young adolescents and children as young as nine years of age. There was a yearly increase in the number of SH cases nationally, with an overall 113% increase in 5 years. These findings may be useful in allocating resources and targeting preventive strategies and working towards reducing the rates of SH and suicide in New Zealand. Telepsychiatry may be useful to increase medical cover in rural areas. Acute home-based treatment or targeted intensive outreach care should be considered for this group of individuals to provide crisis interventions and problem solving.

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Appendix A: Data Sheet

Self-Harm In Invercargill; Southland Hospital Data

S No: …. NHI : ….. Address:……

1.	Ethnicity	European…… Māori…… Others……..		
2.	Gender	Male……. Female……		
3.	Age	Below 18 years…… 18-65 years……. Above 65 years ……..		
4.	Living situation	With Whānau…… Independently……..		
5.	Residence	Urban…….. Rural ……..		
6.	Marital Status	Married……. Single…….. In Relationship……		
7.	Employment status	Working full time…… Working part time….. Unemployed…….		
8.	Highest education	School……. Tertiary……..		
9.	On WINZ	Yes……	No……..	
10.	History of psychiatric illness	Yes …….	No…….	
11.	Previous history of Self Harm	Yes……	No…….	
12.	Psychiatric medical treatment	Yes……	No…….	Drug ....
13.	Counselling	Yes…….	No…….	
14.	Family history of psychiatric illness	Yes……	No…..	
15.	Family history of SH	Yes……	No…..	
16.	Family history of suicide	Yes……	No…..	
17.	Alcohol past use	Yes…….	No……..	

18.	Alcohol recent use	Yes……	No……..
19.	Cannabis recent use	Yes……..	No……
20.	Synthetic Cannabis recent use	Yes……	No…….
21.	Violence	Yes……	No…….
22.	H/o Sexual abuse	Yes……	No…….
23.	H/O physical abuse	Yes……	No…….
24.	Psychiatric diagnosis	……	
25.	Comorbid medical diagnosis	……..	
26.	Alcohol in index SH	Yes……	No……
	Cannabis in index SH	Yes……	No…….
	Synthetic cannabis in index SH	Yes……	No…….
27.	Method for index SH	Overdose…….	
		Cutting…….	
		Gassing……	
		Gunshot…….	
		Hanging……	
		Strangulation…….	
		Others……..	
28.	Stressor for SH	Relationship breakup……	
		Bereavement……..	
		Medical illness……	
		Financial……..	
		Arguments……..	
		School/academic……	
		School bullying……..	
		Others ……	
29.	Outcome	No follow up	
		Followed up by GP	
		MHS – attended	
		MHS – DNA	
		Admitted to Med/Surg/ICU	
		Admitted to MHU	
30.	Suicide	Yes……..	No…….

Appendix B: Tables for Urban/Rural SH

Table 2a: Demographics of patients enaging in SH from rural and urban areas

		Area of Residence						
		Rural (n=53)		Urban (n=238)				
		Count	Column N%	Count	Column N %	χ^2	df	P Value
Ethnicity	European	45	84.9	163	68.5	5.80	2	0.054
	Māori	7	13.2	62	26.1			
	Others	1	1.9	13	5.5			
Sex	Male	24	45.3	85	35.7	1.69	1	0.193
	Female	29	54.7	153	64.3			
Marital Status**	Married	11	25.6	35	18.4	5.22	2	0.073
	Single	13	30.2	94	49.5			
	Relationship	19	44.2	61	32.1			
Living situation	Whānau	38	71.7	157	66	0.64	1	0.422
	Independently	15	28.3	81	34			
Employment Status**	Working Full Time	22	51.2	37	19.4	18.66	2	0.000089
	Working Part Time	3	6.9	25	13.2			
	Not Working	18	41.9	128	67.4			
Highest Education	School	43	81.1	164	68.9	3.15	1	0.0757
	Tertiary	10	18.9	74	31.1			
WINZ	Yes	9	17.0	94	39.8	9.81	1	0.001*
	No	44	83.0	142	60.2			

**Marital and employment status- analysis was done for individuals over 18 years)
(* significant at p< 0.05)

Table 2b: Clinical characteristics of individuals engaging in SH in urban and rural areas

		Area of Residence						
		Rural		Urban				
		Count	Column N %	Count	Column N %	χ^2	df	P value
Comorbid Psychiatric Diagnosis	Yes	32	60.4	163	68.5	1.289	1	0.256
	No	21	39.6	75	31.5			
Comorbid Medical Diagnosis	Yes	22	41.5	95	39.9	0.045	1	0.830
	No	31	58.5	143	60.1			
Psychiatric Medical Treatment	Yes	19	35.8	110	46.2	1.808	1	0.169
	No	34	64.2	128	53.8			
Counseling	Yes	2	3.8	20	8.4	1.329	1	0.248
	No	51	96.2	218	91.6			
Anti-depressants	Yes	17	32.1	90	37.8	0.614	1	0.433
	No	36	67.9	148	62.2			
Anxiolytics	Yes	0	0.0	2	0.8	0.440	1	0.507
	No	52	98.1	236	99.2			
Mood-stabilisers	Yes	0	0.0	4	1.7	0.903	1	0.341
	No	53	100.0	234	98.3			
Antipsychotics	Yes	2	3.8	15	6.3	0.503	1	0.477
	No	51	96.2	223	93.7			
Current client of MHS	Yes	8	15.1	36	15.1	0.000033	1	0.99
	No	45	84.9	202	84.9			
Family history of psychiatric disorders	Yes	14	26.4	64	26.9	0.0049	1	0.943
	No	39	73.6	174	73.1			
Family history of SH	Yes	3	5.7	11	4.6	0.102	1	0.749
	No	50	94.3	227	95.4			
Family history of suicide	Yes	4	7.5	23	9.7	0.230	1	0.630
	No	49	92.5	215	90.3			

Table 2c: Substance abuse in patients engaging in SH (Urban and Rural areas)

		Area of Residence						
		Rural (n=53)		Urban (n=238)				
		Count	Column N %	Count	Column N %	χ^2	df	P value
Alcohol Past use	Yes	29	54.7	122	51.3	0.207	1	0.648
	No	24	45.3	116	48.7			
Alcohol Recent use	Yes	29	54.7	122	51.3	0.207	1	0.648
	No	24	45.3	116	48.7			
Recent use of cannabis	Yes	16	30.2	77	32.4	0.093	1	0.759
	No	37	69.8	161	67.6			
Recent use of synthetic cannabis	Yes	6	11.3	40	16.8	0.980	1	0.322
	No	47	88.7	198	83.2			
Alcohol in index SH	Yes	30	56.6	127	54.1	0.114	1	0.735
	No	23	43.4	108	45.9			
Cannabis in index SH	Yes	12	22.6	55	23.1	0.0053	1	0.941
	No	41	77.4	183	76.9			
Synthetic Cannabis in index SH	Yes	3	5.7	27	11.3	1.514	1	0.218
	No	50	94.3	211	88.7			

Table 2d: Various Psychiatric diagnoses in patients engaging in SH from rural and urban areas

		Area of Residence						
		Rural (n=53)		Urban (n=238)				
		Count	Column N %	Count	Column N %	χ^2	Df	P value
Personality Disorder	Yes	9	17	41	17.2	0.0018	1	0.965
	No	44	83	197	82.8			
Depression	Yes	22	41.5	93	39.1	0.107	1	0.743
	No	31	58.5	145	60.9			
Serious mental illness	Yes	4	7.5	32	13.4	1.391	1	0.238
	No	49	206	206	86.5			
ADHD/ODD/Conduct disorder	Yes	2	3.8	11	4.6	0.073	1	0.786
	No	51	96.2	227	95.4			

Table 2e: Various medical diagnoses in patients engaging in SH living in urban and rural areas

		Area of Residence						
		Rural (n=53)		Urban (n=238)				
		Count	Column N %	Count	Column N %	χ^2	df	P value
Hypertension	Yes	1	1.9	9	3.8	0.468	1	0.493
	No	52	98.1	229	96.2			
Endocrinal disorders	Yes	2	3.8	14	5.9	0.371	1	0.542
	No	51	96.2	224	94.4			
Asthma	Yes	4	7.5	21	8.8	0.089	1	0.764
	No	49	92.5	217	91.2			
Other Diseases	Yes	17	32.1	64	26.9	0.580	1	0.446
	No	36	67.9	174	73.1			

Table 2f: Methods of SH used by Patients living in rural and urban areas

		Area of Residence						
		Rural (n=53)		Urban (n=238)				
		Count	Column N %	Count	Column N %	χ^2	df	P value
Self poisoning	Yes	39	73.6	169	71	0.141	1	0.707
	No	14	26.4	69	29			
Cutting	Yes	12	22.6	50	21.0	0.068	1	0.792
	No	41	77.4	188	79.0			
Other Methods	Yes	9	17	31	13	0.572	1	0.449
	No	44	83	207	87			

Table 2g: Violence/Abuse in patients engaging in SH living in Urban and Rural areas

		Area of Residence						
		Rural (n=53)		Urban (n=238)				
		Count	Column N %	Count	Column N %	χ^2	df	P value
Violence	Yes	11	20.8	60	25.2	0.466	1	0.494
	No	42	79.2	178	74.8			
History of sexual abuse	Yes	9	17.0	59	24.8	1.476	1	0.224
	No	44	83.0	179	75.2			
History of physical abuse	Yes	8	15.1	52	21.8	1.208	1	0.271
	No	45	84.9	186	78.2			

Table 2h: Distress related to index SH (Urban and Rural residence)

		Area of Residence						
		Rural (n=53)		Urban (n=238)				
		Count	Column N %	Count	Column N %	χ^2	df	P value
Relationship break-up	Yes	11	20.8	67	28.2	1.208	1	0.271
	No	42	79.2	171	71.8			
Bereavement	Yes	5	9.4	24	10.1	0.020	1	0.886
	No	48	90.6	214	89.9			
Recent medical diagnosis	Yes	4	7.5	16	6.7	0.046	1	0.830
	No	49	92.5	222	93.3			
Financial stress	Yes	9	17	45	18.9	0.106	1	0.744
	No	44	83	193	81.1			
Arguments	Yes	6	11.3	45	18.9	1.726	1	0.188
	No	47	88.7	193	81.1			
Other reasons	Yes	28	52.8	90	37.8	4.053	1	0.044
	No	25	47.2	148	62.2			

Table 2i: Outcome of index SH

	Area of Residence						
	Rural (.N=53)		Urban (N=238)				
	Count	Column N %	Count	Column N %	χ^2	df	P
No Follow up	2	3.77	9	3.78	3.08	5	0.69
GP Follow up	17	32.07	6	28.15			
MHS follow up /attended	17	32.07	69	28.99			
MHS follow up/DNA	0	0	5	2.10			
Admission/Med/surgical/ICU	6	11.32	45	18.9			
Admission/ MHU	11	20.75	43	18.06			